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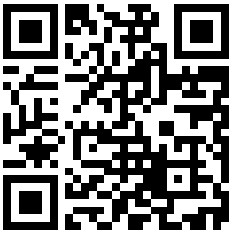

Geoffrey J. Webdale.

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The first magazine devoted to Wireless Telegraphy.

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Vols I + II Apr. 1911 - March 1913

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"No familiarity with the subject removes the feeling of vague wonder with which one sees a telegraphic instrument, merely connected with a length of 150 feet of copper wire run up the side of a flagstaff, begin to draw its message out of space and print down in dot and dash on the paper tape the intelligence ferried across 30 miles of water by the mysterious ether."

DR. J. A. FLEMING, F.R.S.

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Photo] [*Elliott & Fry, London.*

G. MARCONI, ESQ., LL.D., D.SC.

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THE MARCONIGRAPH

No. 1. Vol. I April, 1911. Subscription, 3/- per annum, post free. Price 2d. Post Free 3d.

OUR frontispiece is a reproduction of the most recent photograph of Commendatore Guglielmo Marconi, the inventor who has given his name to our magazine.

Mr. Marconi, who was born at Bologna, in Italy, in the year 1874, and who is Irish on his mother's side, first began to interest himself in the problem of wireless telegraphy in 1895, and in the following year came to England, taking out the first patent ever granted for a practical system of wireless telegraphy by the use of electric waves. Having once demonstrated the possibilities in store, he set to work to improve this fundamental patent. The work that he did in the next four years, during which he visited nearly every part of Great Britain and many places on the Continent of Europe and America, we need not enter into here, but the time and attention he spent on the subject met its reward in the crowning achievement of the now famous 7,777 patent of 1900 for syntonisation and selectivity. The originality of this remarkable invention, to which all the subsequent development of wireless telegraphy is due, has recently been triumphantly vindicated in the Royal Courts of Justice.

Immediately after this wonderful invention, Mr. Marconi determined to unite Canada and Great Britain by the aid of wireless telegraphy, and in the latter half of 1901, succeeded in receiving signals communicated from Poldhu in Cornwall at St. John's, Newfoundland. The daring of this project was all the greater when we consider that at the time the idea, when proposed, was ridiculed by many eminent men both in lectures and in the Press.

Since this initial success, important developments have rapidly followed each other, and to-day a regular service is maintained between Clifden in Ireland and Glace Bay in Nova Scotia, the messages being distributed thence to all parts of the European and American Continents.

Mr. Marconi's work has been recognised by many governments and seats of learning: he has been decorated by the King of Italy and the Czar of Russia, is an honorary doctor of many universities, including Oxford, Glasgow, Aberdeen, Liverpool and Pennsylvania, besides having received the Freedom of the principal Italian cities. In 1909 he was accorded what is perhaps the highest distinction that can be obtained by any scientist—the Nobel Prize for Physics.

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THE MARCONIGRAPH

An Illustrated Magazine for all interested in WIRELESS TELEGRAPHY, published monthly

by

MARCONI'S WIRELESS TELEGRAPH COMPANY, LIMITED, Watergate House, York Buildings, Adelphi, London, W.C.

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NEW YORK .....The Marconi Wireless Telegraph Company of America, 27, William Street.
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The Editor will be pleased to receive contributions ; and Illustrated Articles will be particularly welcomed. All such as are accepted will be paid for.

All communications to be addressed to

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NOTES.

The recent law case against The British Radio-Telegraph and Telephone Company, Ltd., for the infringement of Mr. Marconi's patent, was remarkable in regard to the amount of highly technical detail which the Court had to master before giving their verdict. The judgment delivered by Mr. Justice Parker has had the effect of proving conclusively the indisputable claim of the Marconi system of wireless telegraphy to be based on a master patent.

A brief account of the trial which occupied the court fourteen days is given on pages 9-12.

Very shortly there will be a complete Radio-Telegraphic Service between ships at sea and the Spanish Coast. That country will also be linked together with other countries by means of wireless telegraphy and an accelerated service in the interior of the Peninsula will likewise be available.

The Compania Nacional de Telegrafia sin hilos de España, which has a capital of 6,500,000 pesetas, was recently formed to take over the concession granted to Señor Don Frederico Rohr, representative of the Sociedad Española Oerlikon Huber y Compañia for the construction of a public wireless telegraph service in Spain, and for the use of service on vessels in Spanish seas. The Company's engineers are now busily engaged in erecting stations of considerable range at the following points :—

CADIZ, LAS PALMAS, TENERIFFE, CABO VILANO, MADRID, BARCELONA, CABO GATA and BALEARIC ISLANDS.

As a large number of vessels carrying wireless apparatus are constantly within communication range with these points, an extensive ship to shore service should be established.

A number of radio-telegraphic stations in various parts of the world will be opened to public service in Spain and the Canary Islands.

We propose to deal more fully with this subject in an early issue.

* * * *

Arrangements were recently made between the Compagnie di Telegraphie Sans Fils of Brussels, who are the licencees of the Marconi patents in Germany, and the various German Companies interested in the Telefunken Company, whereby their interests in wireless telegraphy for the German Mercantile Marine have been transferred to a new company styled " Deutsche Betriebs-Gesellschaft für Drahtlose Telegraphie m.b.H." By this arrangement the competition which hitherto existed between the Marconi Companies and the Telefunken interests, in so far as the German Mercantile Marine was concerned, has come to an end.

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The Marconi Wireless Telegraph Company of America consider they have created a new record in the way of a quick delivery of wireless plant on board ship, when they recently equipped three American war vessels within a week of the contract.

* * * *

It is with deep regret that we have to record the death, on the 6th January last, of Mr. G. L. Bullocke, late Traffic Manager of the Marconi Companies in London. Mr. Bullocke joined the staff more than ten years ago, and his genial disposition made him extremely popular with all whom he came into contact.

Mr. W. R. Cross, formerly in charge a Liverpool, has been appointed to succeed Mr. Bullocke as Traffic Manager, and Mr. F. E. D. Pereira is at present in charge at Liverpool.

Captain Adrian Simpson, late of H.M. Indian Army, has been appointed to the head office staff of Marconi's Wireless Telegraph Co., Ltd., in London.

Mr. Alfred Eddington, formerly assistant in the Test-Room at the Company's works at Chelmsford, was appointed assistant works' manager on 25th March last.

☼ ☼ ☼ ☼

NEW POSTAL ARRANGEMENTS FOR MARCONIGRAMS.

Marconigrams may now be received at any postal telegraph office for transmission to ships at sea when such vessels have passed beyond, or have not yet entered into, the radius of operation of the Postmaster-General's coast stations.

Such telegrams should be addressed in the form, " Jones, steamship ' Mauretania,' Poldhu," and will be charged for at the inclusive rate of 3s. per word. The Marconi station at Poldhu has a range of about 1,500 miles, and should the ship to which the message is addressed have passed beyond this range, the telegram will be forwarded (without extra charge) by telegraph to the Marconi Company's long-distance station at Cape Cod.

A list of the ships to which this service extends will be found marked with an asterisk in the Post Office Guide.

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MARCONI FIELD STATION APPARATUS.

Very successful tests have been carried out with the latest pattern of the Cavalry Field Station.

The tests were carried out between Broomfield, Chelmsford, and a position 4 miles on the other side of Ipswich, a distance of over 40 miles, and good readable signals were obtained on all three wave lengths.

The new 1½ K.W. portable military stations are entering on their final stage of testing and promise to give excellent results.

☼ ☼ ☼ ☼

WIRELESS ON AEROPLANES: Experiments in America.

Perhaps the most interesting matter in connection with wireless telegraphy which took place in America during the past month was the experiments made wherein wireless messages were received by a passenger on an aeroplane. From Palm Beach on March 6th last, Aviator J. A. D. McCurdy, accompanied by the Marconi engineer, Percy G. B. Morriss, who is at present in charge of the Marconi Station at the Hotel Breakers at Palm Beach, ascended in his aeroplane to a height of over 1,800 feet, circled around for some time, and through a very simple receiving set installed in the aeroplane, Morriss was able to receive distinctly signals from the stations at Key West and Havana, and perfectly read a message which was being transmitted by a passing fruit vessel to Key West Station. For some reason signals were not received from the Palm Beach Station: whether it was too directly below the aeroplane, or whether there were no signals transmitted, is unknown, as full particulars have not come to hand, but the matter will probably be referred to in our next issue with data from operator Morriss.

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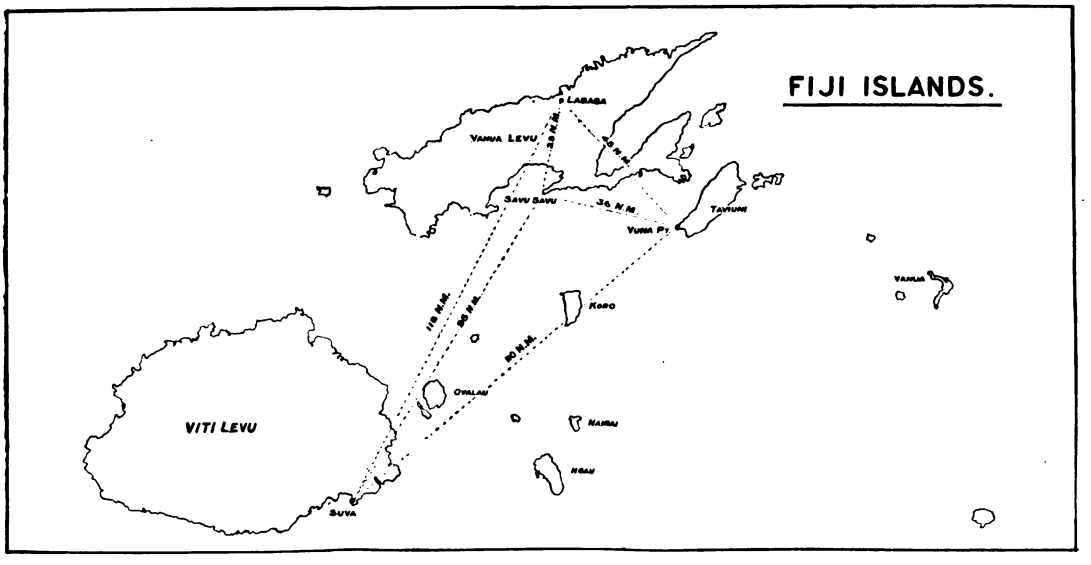
WIRELESS TELEGRAPHY IN FIJI.



Several years ago Marconi apparatus was utilized to connect Tasmania with the mainland, and the results were eminently satisfactory throughout the period of the demonstration which was conducted at the Company's expense. Ever since then tenders have been called for from time to time, but, in this year of grace, no commercial wireless telegraph station exists either in Australia or in New Zealand with their enormous coast lines. The enterprise of the great shipping lines, such as the P. and O., the Orient, the White Star and the Blue Funnel, in having their vessels fitted with the Marconi System is thus, for the present, dependent for its reward upon the presence of ships lying in Australian ports fitted with wireless telegraph apparatus and serving as coast stations.

It is therefore refreshing to be able to chronicle the fact that the little colony of Fiji has decided to adopt the uses of wireless telegraphy.

Suva, the capital, Vuna Point, Savu-Savu and Lambasa are the places where the first installations will be made.

The Suva Station will be the most important, and while the equipment at present being installed is of no greater power than 5 K.W., care has been taken in choosing the site and in laying out the installation in such manner, that the additional plant necessary for communication to be effected with the mainland of Australia may be conveniently and economically installed.

Savu-Savu and Vuna are being fitted with 1½ K.W. sets, but Lambasa will have a 5 K.W. installation similar to that at Suva, for although the air-line distance between the two last mentioned stations is no greater than 117 nautical miles, a certain amount of land intervenes, rising near Lambasa to upwards of 3,000 feet, while a certain reserve of power was considered desirable in apprehension of frequent atmospheric disturbances. It is expected that both the Suva and Lambasa Stations will have a working range with ships of 350 miles during the day, and from two to three times that distance at night. For all stations a uniform arrangement of masts has been adopted, consisting of a central steel tubular mast ("Gray" type) 160 feet in height and four light tubular steel

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telegraph poles, each sixty feet high. The five K.W. Stations are furnished with a 10 H.P. Gardner engine direct coupled to a continuous current dynamo, available for charging a battery of accumulators or for running the motor-generator-disc.

It is intended that the battery shall be used as the general rule to energise the transmitting plant.

The 1½ K.W. Stations are of the Company's standard type of ship set energized by an oil engine and furnished with a storage battery. Similar installations are in use, among other places, at Aden, Berbera, and at the new station at Cocos (Keeling Islands) which is about as far to westward of the Australian continent as Suva is to the eastward.

The Suva, Vuna Point and Savu-Savu Stations are to be completed on or before April 30th, but the Lambasa Station will probably not be opened much before August 31st.

Mr. John J. Leary is the Company's engineer in charge of the work, and he is assisted by Messrs. Keith, Strickland and Nicholls.

¤ ¤ ¤ ¤

CAPE TOWN— SLANGKOP STATION.

The latest reports from the Company's engineer, Mr. Kos, state that the masts on the Slangkop station should be completed by about the 29th March, and it is therefore probable that as soon as the station is handed over to the Union Government it will be opened to public maritime service during the month of April.

The station will be of 5 K.W., and is designed for a working range of 400 nautical miles for sea, and for a maximum range considerably exceeding this figure. The power for operating the station is obtained from a battery of accumulators consisting of 60 cells and having a capacity of 240 ampere hours, the accumulators in their turn being charged by means of a D.C. dynamo directly coupled to a 10 H.P. Gardner engine. Should it be required at any time for special purposes to obtain more power, the station has been arranged in such a manner that this can be effected by running the D.C. dynamo and accumulators in parallel.

The transmitting apparatus is designed to tune to waves of 300 and 600 metres as well as to any waves between 600 and 1,200 metres, whilst the receiving apparatus can be tuned to any wave from 100 to 2,500 metres.

The aerial system will consist of a four part multiple wire umbrella aerial supported by 5 masts of which the centre is 230 feet over ground; the parts of the aerial being independently supported in pairs between the main mast and the adjacent extension masts.

As ships carrying the standard 1½ K.W. Marconi sets have frequently been in communication with the Durban station whilst lying at anchor in Cape Town harbour, it is only reasonable to anticipate that as soon as the Slangkop station has been opened, Cape Town and Durban will then be in direct communication, at any rate by night.

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COCOS STATION.

March 2nd witnessed the opening of the station which has been established on Cocos (Keeling) Islands, midway between Colombo and Fremantle.

The vessels of the Orient and P. & O. Companies pass within easy working distance of the station, which is of the usual 1½ K.W. type and has a wireless telegraph range of 200 miles and upwards.

Cocos is on the Eastern Extension Australia and China Telegraph Company's system, and the station, which was erected under the supervision of Mr. Rackstraw, will be operated by the Cable Company's staff. In due course, similar arrangements will be made at Hong Kong, Singapore, Malta and Gibraltar.

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OTHER NEW MARCONI COAST STATIONS.

The following coast stations were recently erected and opened for public service:—

In Italy: Cagliari, Palermo, Naples, Isola Chiesa (Maddalena), owned by the Italian Government. In Arabia and Somaliland at Aden and Berbera respectively, which belong

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to the Colonial Office ; and at Durban for the South African Government.

The Marconi Wireless Telegraph Company of America are responsible for four new stations in the United States at Cape May (New Jersey), Palm Beach and Fernandina (Florida), and Virginia Beach (Virginia) ; and the Marconi Wireless Telegraph Company of Canada, Limited, for a new Canadian Station at Pictou. Another new Marconi Station at Grindstone (Magdalen Island) is owned by the Canadian Government.

STATIONS CLOSED.

The station at Isola Chiesa (Maddalena) was opened in lieu of the Asinara station which was recently closed by the Italian Government.

* * * *

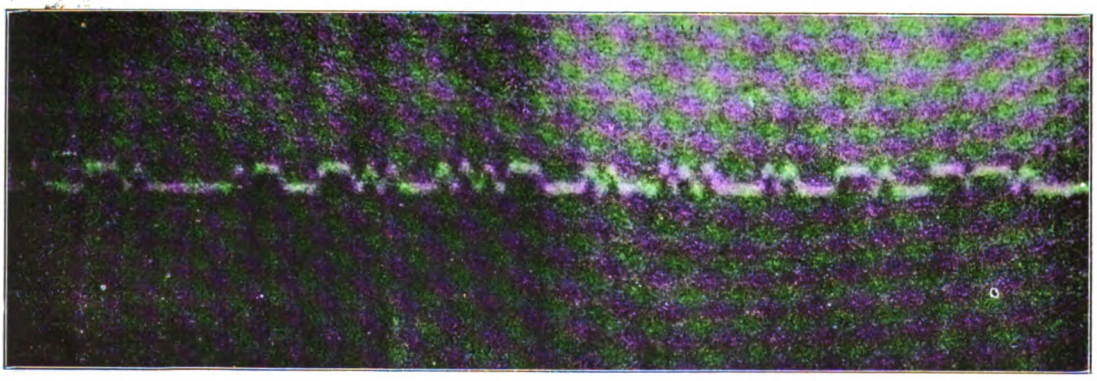
Proving the utility of Wireless.—Wireless telegraphy was again to the fore when, owing to a breakdown of the cable between Stornoway and the mainland, communications were carried on from February 27th by means of wireless between the Lochboisdale and Tobermory wireless telegraph stations.

MARCONI ATHLETIC CLUB (LONDON).

Formed in 1905, with Mr. Marconi as president, the "Marconi Cricket Club" has had a very flourishing career. Owing to the enormous increase in the business of the Marconi Company, which has necessitated considerable enlargement of the staff, the present year was thought to be a most opportune time for a more ambitious club to be instituted, and in consequence, the "Marconi Athletic Club" was recently formed, to include, cricket, tennis and football sections, and opened for membership to all members of the Marconi staff. A capital ground, the "Ravensbank Athletic Ground," at Lower Sydenham, has been acquired ; Mr. Marconi has again honoured the club by his presidency, and Mr. Bradfield the captaincy, and with a good list of fixtures arranged, there is every promise of a most successful season.

It is hoped that some time during the cricket season a sports gathering may be held, and with the enthusiastic support of the whole of the staff, the club should prove a tremendous success.

TRANSATLANTIC TELEGRAPHY.



A remarkable photographic record of Wireless Signals received at Clifden, Ireland, from Glace Bay, Canada, a distance of 2,200 miles.

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MARCONI AND MARCONI'S WIRELESS TELEGRAPH Co., Ltd.,

versus

THE BRITISH RADIO-TELEGRAPH AND TELEPHONE Co., Ltd.,

Before

Mr. JUSTICE PARKER,

for Infringement of Patent No. 7,777 of 1900.

A brief account of the trial in December 1910 and January 1911, and an abridgement of the judgment delivered 21st February, 1911.

This action was brought by Mr. Marconi and Marconi's Wireless Telegraph Company Limited to restrain the British Radio-Telegraph and Telephone Company Limited from infringing the Plaintiffs' Patent No. 7,777 of 1900 and two other patents, but at the commencement of the proceedings it was agreed between the parties to confine the present case to the principal patent as the apparatus covered by the other patents could not be usefully employed without that of the principal patent.

The case was heard before Mr. Justice Parker in the Chancery Division of the High Court of Justice in London, on the 12th, 13th, 14th, 15th, 16th, 20th and 21st of December, 1910, and on the 11th, 12th, 13th, 17th, 18th, 19th, and 20th of January, 1911, and Judgment for the Plaintiffs was delivered on the 21st February, 1911.

The Plaintiffs claimed that the Defendants had manufactured and sold, and were offering for sale, apparatus infringing their Patent No. 7,777 of 1900, and asked for an injunction, damages, delivery up of infringing apparatus, and costs.

The Defendants contended that they had not infringed the patent and that the patent was not valid, and in support of their contention cited numerous documents and called no less than seven witnesses.

In support of their contention of non-infringement the Defendants argued that a two-coil transformer was an essential feature of the invention, that they were using a one-coil or auto-transformer, and that an auto-transformer was not a known equivalent of a transformer at the date of the patent. Further they argued that if the auto-transformer they were using was an infringement they might instead use a single coil with an equal number of turns in each circuit which would not even be an auto-transformer and, therefore, could not infringe.

In support of their contention of invalidity the Defendants relied upon the following patents:—

No.	Granted to
8,575 of 1891	Nikola Tesla.
20,981 ,, 1896	,, ,,
11,575 ,, 1897	Oliver Lodge.
18,644 ,, 1897	,, ,,
29,505 ,, 1897	,, ,,
525 ,, 1898	Silvanus Thompson.
1,862 ,, 1899	Ferdinand Braun.
22,020 ,, 1899	,, ,,

and upon numerous papers and articles by Tesla, Oudin, Lodge, Evershed, Fleming, Brown, Fessenden and Blondin, published in the "Journal of the Institution of Electrical Engineers," "L'Electricien," "The Electrician," "Proceedings of the National Electric Light Association," "Comptes Rendus," "Electrical World," "Electrical Review," and "Eclairage Electrique." The Defendants argued that all these specifications and publications anticipated the patent, and if they did not anticipate it that they deprived it of subject matter.

As the case developed the Defendants further contended that the patent did not give sufficient directions how the invention was to be carried into effect, and yet at a

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later stage they endeavoured to read all the necessary information into Braun's Patent No. 1,862 of 1899.

Judgment

(*Considerably abridged.*)

Before going into the question of the infringement and validity of Patent No. 7,777 of 1900, it will be convenient to say a few words about wireless telegraphy generally, and the problems which its practical application has involved, as only in this way can a proper conclusion be arrived at.

Wireless telegraphy in the sense here used operates by disturbances in the ether produced by the sudden discharge of a condenser, and in this respect is entirely different to magnetic induction telegraphy. Moreover, the effect produced on the receiver falls off in the latter case, as the cube of the distance from the transmitter, and in the former case only as the square of the distance, from which it follows that the utilisation of these disturbances for conveying signals must be far more efficient than the utilisation of lines of magnetic force.

Henry first noticed that the discharge from a condenser was oscillatory. Kelvin and Helmholtz established the relation between the frequency of the discharge and the resistance, capacity and inductance of the circuit. Clerk Maxwell showed that the oscillatory discharge of a condenser must give rise to a disturbance in the ether travelling with the velocity of light. Hertz supplied the experimental verification of Clerk Maxwell's theory and produced the well-known Hertz radiator and resonator, the latter having a minute spark gap. Branly and Lodge produced the coherer, which, substituted for the minute spark gap of Hertz's resonator, made a much more sensitive receiver. In 1892 Crookes first suggested the utilisation of Hertz's waves for wireless telegraphy, and in 1894, the year after Hertz's death, Lodge gave his famous lecture on "The Work of Hertz." In this lecture Lodge gave a vry clear and complete account of the knowledge of Hertzian waves at that date, he pointed out the necessity for a persistent train of waves in order to obtain selectivity, and stated that conspicuous energy of radiation and persistent oscillation were incompatible—a statement which is true to-day when we remember that he was referring to a single circuit.

In 1896 Marconi applied for his Patent No. 12,039, of 1896, which was the first patent ever granted for a system of ether wave telegraphy. It embodied, among a large number of minor improvements, the utilisation of an elevated aerial and an earth, but had a number of drawbacks. Not only was there the drawback, pointed out by Lodge, that being a good radiator the aerial could not be a good oscillator, but it also suffered from the limitation of capacity and potential of the aerial and therefore of the energy which could be utilised.

In 1897 Lodge applied for his Patent No. 11,575 of 1897, in which he employed an inductance with a large capacity aerial in order to prolong the train of waves and improve selectivity. He thus made a compromise, sacrificing the radiating in order to improve the oscillating properties of his aerial. In other respects his system resembled Marconi's. His aerial was vertical and not horizontal, and he says it may be earthed if desired, and he, too, uses a coherer of metal filings with a mechanical decohering arrangement.

Later, in the same year, Lodge applied for another Patent, No. 29,505 of 1897, and the following year Sylvanus Thompson applied for Patent No. 525 of 1898. Both these patents relate to inductive telegraphy, and neither of them throws any light on the difficulties incident to utilising the principle of resonance in a system of telegraphy by ether waves.

Marconi also applied for Patents Nos. 12,326 of 1898, 6,892 of 1899, and 25,186 of 1899, all of which refer to the use of a transformer in the receiver for the purpose of increasing the voltage applied to the coherer.

It is true that Braun's Patent No. 1,862 of 1899 preceded Marconi's Patent No. 7,777 of 1900, but as there is no evidence that it was put into practice I have now mentioned all that is necessary for the interpretation of the latter specification.

Marconi commences his specification with the statement that the object of his invention is to increase the efficiency and to secure selectivity. He obviously refers to the

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difficulty pointed out by Lodge, namely, that you cannot have your circuit doing two incompatible things, however desirable, at the same time, and he says in effect: Take two circuits and let one do one of the things and the other do the other. For this purpose he employs a closed oscillating circuit coupled to an open radiating or absorbing circuit and adjusts all four circuits to have the same time period.

The interpretation I have put on the patent seems to me after careful consideration the true and indeed the only possible interpretation, but before leaving the subject I must mention the matter of coupling upon which considerable stress was laid at the trial. It was contended that loose coupling was essential to success, that no direction as to coupling is given, and that in one out of the nine examples given the coupling is not very loose. In my opinion the direction to couple loosely is impliedly if not expressly given in the specification.

It is not disputed that the invention does get over the difficulties it was designed to meet. It produced a persistent train of waves, increased the available energy, doubled at once the distance of communication, and secured selectivity. The utility of the invention cannot be doubted.

I propose next to consider whether the invention was anticipated by Braun's Patent No. 1,862 of 1899. Braun's Patent involves many difficulties and he was evidently unacquainted with what Marconi and Lodge had already done. The essential feature of Braun's invention is the utilisation of lower frequencies than he thought were being used, and it is clear that the specification does not contain even the remotest suggestion of the problem which Marconi's Patent of 1900 was intended to solve, much less any suggestion bearing on its solution.

That I am right in this conclusion will be further evident when I consider the objection founded on want of subject matter. In considering this plea it is important to remember that two circuits in the receiver was no novelty. Lodge had two circuits in his 1897 patent. He was an engineer of first-rate ability endeavouring to get over the difficulty he had himself explained. He had two circuits at his receiving end, and in a way, at his transmitting end also, and yet he failed to see that if he utilised the principle of resonance as between those two circuits the problem would be solved. Marconi had two circuits in his 1898 patent and did not tune them. In the transformers of Tesla and Oudin rough tuning was done to overcome the disadvantage of comparatively loose coupling, but this was only with the object of raising the voltage and is a very different thing from deliberately loose coupling and tuning two circuits together with the object of producing a long train of waves and securing the full benefit of resonance between the receiver and transmitter. In the literature quoted there is no trace of the idea underlying Marconi's invention and not a single suggestion from which a competent engineer could arrive at this idea. I hold, therefore, that the plea of want of subject matter entirely fails.

The only other plea of invalidity is based on the prior grant of Braun's Patent No. 22,020 of 1899. This patent is similar to the previous one with the addition of an earthed aerial. He says nothing of tuning, and the specification contains a passage which in my opinion is inconsistent with the two circuits being intended to be tuned together. I cannot see how it can be said that this patent contains a grant of the invention described in Marconi's 1900 Patent.

Having come to the conclusion that Marconi's 1900 Patent is a good and valid patent, I must now consider the question of infringement. The Defendants' transmitter contains two circuits, one a closed circuit which is a good conserver of energy and a persistent oscillator, and the other an open circuit which is a good radiator. These circuits are intended to be tuned together and contain adjustable devices for that purpose. They are also linked together in such a way that the oscillations in the closed circuit will gradually build up and maintain in the open circuit like oscillations, thus radiating a long train of waves. Similarly, the receiver contains two tunable circuits linked together. It appears, therefore, that the Defendants' apparatus contains all the essential features protected by Marconi's 1900 Patent.

It is contended that an auto-transformer such as the Defendants are using was not a known equivalent of a transformer at the date of the patent and further that they might use an inductive shunt which would not be a transformer at all. I cannot con-

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ceive, however, that an electrical engineer in, say 1899, would have had any doubt that what could be done by a two-coil air core transformer could also be done by an air core auto-transformer, and this even if arranged one to one, although an inductive shunt had never been used as a transformer before. In my opinion, however, the use of a two-coil instrument is not an essential feature of Marconi's invention at all, and it is a matter of indifference whether a transformer or an auto-transformer be used.

Being of opinion that every claiming clause of Marconi's Patent of 1900 is a claim for an entirely novel combination producing an entirely new and useful result, and that the use of a two-coil transformer is no essential part of his invention, I hold that the Defendants, who in my opinion have taken all the essential parts of the invention, are infringers, notwithstanding that they have substituted an auto-transformer for a transformer in the combination claimed, and notwithstanding that the use of an auto-transformer with an air core for any such purpose as that for which Marconi has used the transformer may have been new.

The action, therefore, in my opinion, succeeds.

The Plaintiffs were granted a certificate of validity of their patent and an injunction, costs and damages against the Defendants.

WIRELESS APPARATUS FOR THE NEWFOUNDLAND SEALING FLEET.

Marconi Wireless Apparatus was this year for the first time used by several of the steamers of the Newfoundland Sealing Fleet which left St. John's for the East Coast and the Gulf of St. Lawrence on March 14th.

SS. "Adventure," "Bonaventure," "Bellaventure." Three of the vessels which were equipped with Marconi Apparatus previous to this year's voyage.

The first wireless message was received on Friday night, March 17th, which indicated that the ice conditions were most unfavourable.

The annual seal hunt, one of the main industries of Newfoundland, is a thing of which very little is heard in the outside world. The open season lasts from March 12th to May 1st each year.

Until the year 1863 it was carried on entirely by small schooners of not more than a hundred tons register.

The first steam ice-hunter came to the country in 1863, from Glasgow, to Messrs. Walter Grieve & Co., of St. John's. Built of stout British oak throughout, the "Bloodhound," as she was called, carried sails in addition to her steam power, and was barque rigged.

More ships of the "Bloodhound" type followed each year until the sailing vessel was almost precluded. Up to the year 1904 all steamers carried sails, but from that time they have been slowly discarded. All yards have been done away with, and now only one or two of the oldest steamers carry staysails.

In 1906 a new departure was made. Messrs. Harvey & Co., of St. John's, had a steel steamer built for the seal fishery. Her nett tonnage was 829, length 250 feet, and breadth 38 feet. She had a specially constructed bow which enabled her to ride up

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on the ice, thereby getting her weight to help in cutting a passage instead of butting dead against it as a straight stem ship would do.

She was christened the "Adventure," and was commanded by Captain Harry Daw, who comes of an old stock of successful seal hunters and has followed the trade from boyhood.

The "Adventure" left St. John's on her maiden voyage on March 10th, 1906, and returned on April 1st with thirty thousand seals valued at fifty thousand dollars (£10,000).

In 1909 four new steel ships were built for the same purpose. Two for Messrs. Harvey & Co., the "Bonaventure" and "Bellaventure." The "Beothic" for Messrs. Job Brothers, and the "Florizel" for Messrs. Bowring Brothers. All were the same type of ship as the "Adventure," but the first three were a trifle smaller, while the "Florizel" was larger.

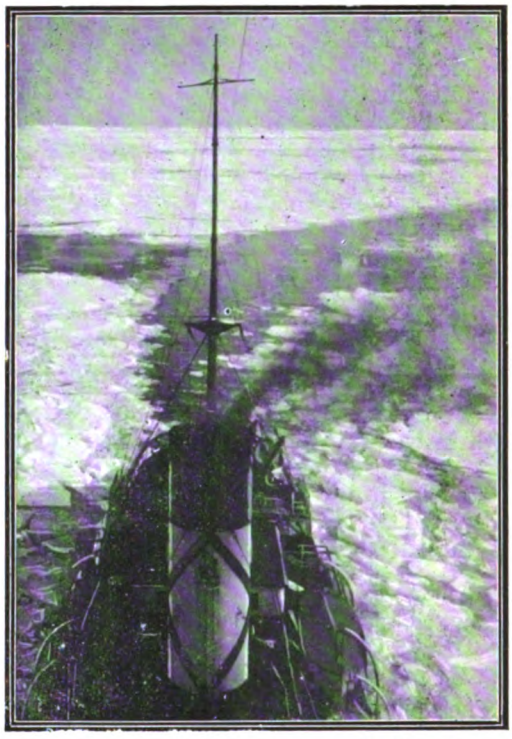
The "Florizel" was commanded by Capt. Abraham Kean, "Bellaventure" by Capt. Job Knee, "Bonaventure" by Capt. Parsons, and "Beothic" by Capt. George Barbour —all tried men and lifelong seal hunters.

The "Florizel" returned first that year with 30,488 seals, while the others followed shortly with valuable loads.

The total catch amounted to two hundred and sixty-nine thousand seals, valued at 458,020 dollars (about £91,604), but the "hunt" proved to be a very disastrous one for the ships.

Two were crushed in rafting ice and went down. The crews of these ill-fated ships, the "Virginia Lake" and the "Vanguard," were picked up by other ships. The "Bloodhound" and the "Neptune" were towed into port with main shafts broken, and many other ships suffered smaller injuries, having rudders broken and propeller blades torn off.

The "Florizel" was the first ship of the fleet to use Marconi Telegraphy. She was the only one fitted with an equipment in 1909. Her progress was reported to the owners, *via* the Marconi Company's station at Cape Race.



View from Aloft, looking from the Barrel.

The May number of "The Marconigraph" will contain an account of the voyage made in 1910 by Ernest T. Fisk, Marconi Officer on board the SS. "Florizel." The article will be illustrated by actual photographs taken by Mr. Fisk.

THE "WIRELESS" HERO.

The damages awarded to Mr. Jack Binns in his action against an American Cinematograph Company have been reduced by Justice Greenbaum of the New York Supreme Court, from £2,500 to £500.

MARCONI NEWS MESSAGES.

A contract has just been concluded with the Royal Mail Line for the transmission of news messages to the following six boats:—"Asturias," "Avon," "Araguaya," "Amazon," "Aragon," "Danube."

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THE MARCONI COMPANIES' PROGRESS IN THE MERCANTILE MARINE.

That the Marconi International Marine Communication Company have, during the past few months, fitted over 100 vessels of the Mercantile Marine is significant of the absolute indispensability of wireless installations on board ship.

The total number of boats installed with the Marconi System now amounts to over 450, most of which conduct a public telegraph service for the Shipping Companies and their passengers.

In addition to this number, the Company has received orders from many large Shipping Companies for the installation of wireless apparatus on vessels now being built, and on vessels which are shortly due in port. The Company have also been favoured with instructions from various Government officials for the equipment of naval ships.

The Eastern Telegraph Company and its associated Companies, which early discovered the utility of wireless telegraphy in connection with the laying of cables, also continue to extend the application of the Marconi System to their cable steamers.

The following twenty steamships of the Union Castle Line, with a service to and from Cape Colony and East Africa, were recently equipped with Marconi apparatus :—

SS. "Edinburgh Castle," "Armadale Castle," "Walmer Castle," "Saxon," "Briton," "Kildonan Castle," "Kinfauns Castle," "Dover Castle," "Durham Castle," "Dunluce Castle," "Garth Castle," "Grantully Castle," "Galeka," "German," "Galician," "Gaika," "Gascon," "Goorkha," "Guelph," "Goth." The Company has also received instructions for the equipment with their modern apparatus of three new boats now building.

They have also been favoured with instructions to equip sixteen vessels of the Booth Line, running between Liverpool and the Amazon, *via* Portugal and Madeira, of which the "Anselm," "Ambrose," "Francis," "Hilary," "Hubert," "Lanfranc," "Stephen," and "Augustine" are already fitted, and the remainder are expected to be fitted shortly. Three vessels of the new "Blue Funnel" Line, controlled by Messrs. Alfred Holt & Company, running between Liverpool and Australia, have also been equipped.

Of the large companies having vessels running to the East, the P. & O. have had the following twelve boats fitted :—SS. "Mooltan," "Persia," "Soudan," "Dongola," "Plassy," "Caledonia," "Himalaya," "Delhi," "Assaye," "Vectis," "Devanha," "Delta," and orders have been received to fit the "Maloja" and "Medina."

The SS. "Osterly," "Orontes," "Orsova," "Otway," "Orvieta" and "Omrah" of the Orient Line, and the SS. "Gloucestershire" of the Bibby Line, are also recent additions to the Marconi service.

The White Star Company's sailing ship "Mersey," for the training of cadets, together with four of the Company's steamships, SS. "Medic," "Afric," "Persic" and "Runic," having a service between England and Australia *via* the Cape, were recently fitted. The "Olympic" and "Titanic" will also be included.

Messrs. George Thompson and Company, the owners of the Aberdeen Line, had their vessels "Miltiades," "Marathon," "Moravian," "Themistocles" and "Demosthenes" equipped with standard ship sets and special emergency apparatus. These boats also carry on a service between London and Australia, *via* the Cape.

The SS. "Oropesa," "Orcoma," "Orita," "Oronsa," "Oriana," "Ortega," "Oravia" and "Orissa," owned by the Pacific Steam Navigation Company, with a service to and from Brazil, River Plate, Falkland Islands, Valparaiso, Callao and all West Coast Ports, have been fitted.

The following is a list of other vessels which have recently been installed with Marconi apparatus, or which are to be fitted shortly :—

ANCHOR LINE, SS. "Perugia," "Italia," "Calabria" and "Cameronia."

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ROYAL MAIL STEAM PACKET COMPANY, SS. "Danube."

DOMINION ATLANTIC RAILWAY COMPANY, SS. "Boston," "Prince George" and "Prince Arthur."

BRITISH INDIA S.N. COMPANY, SS. "Rohilla" and "Rewa."

CANADIAN PACIFIC RAILWAY, "Monteagle," "Princess Adelaide," "Princess Mary."

CUNARD STEAMSHIP COMPANY, SS. "Franconia."

CITY OF DUBLIN STEAM PACKET COMPANY, SS. "Connaught," "Leinster," "Ulster" and "Munster."

JOHN T. RENNIE, SONS & COMPANY, SS. "Intaba."

IQUITOS STEAMSHIP COMPANY, SS. "Huayna," "Atahualpa" and "Manco."

ALLAN LINE, SS. "Scotian."

ATLANTIC TRANSPORT COMPANY, SS. "Mesaba," "Manitou," "Menominee," "Marquette."

BOWRING LINE, SS. "Stephano."

CANADIAN NORTHERN SS. COMPANY, SS. "Royal Edward" and "Royal George."

CAIRN LINE, SS. "Cairnrona" and "Gerona."

DONALDSON LINE, SS. "Saturnia" and "Tritonia."

HUDDART, PARKER & COMPANY, SS. "Zealandia."

LEYLAND & COMPANY, SS. "Canadian" and "Bohemian."

J. FARQUHAR & COMPANY, SS. "Seal."

SPANISH TRANSATLANTIC COMPANY, SS. "P. Satrustegui" and "P. Alfonso XII."

URANIUM STEAMSHIP COMPANY, SS. "Volturno," "Uranium" and "Campanello."

LAMPORT & HOLT, SS. 3 ships building.

OCEANIC STEAM NAVIGATION COMPANY, SS. "Ionic," "Corinthic" and "Athenic."

SHAW, SAVILL & ALBION LINE, SS. "Arawa" and "Tainui."

ELDER, DEMPSTER & COMPANY, SS. "Elmina" and nine other boats.

YEOWARD BROTHERS, SS. "Andorhina."

ADELAIDE STEAMSHIP COMPANY OF AUSTRALIA, SS. "Grantala" and "Koombana."

HOWARD SMITH & COMPANY, OF MELBOURN, SS. "Bombala," "Cooma" and "Peregrine."

MCILWRAITH & MCEACHIARN, OF AUSTRALIA, SS. "Karoola."

COMPANIA PERUANA DE VAPORES Y DIQUE DEL CALLAO, SS. "Urobamba," "Pachitea" and "Mantaro."

CABLE SHIPS.

The cable steamers "Electra," "John Pender" and "Norseman," belonging to the Eastern Telegraph Company and its Associated Companies were equipped some time ago. The SS. "Patrol," "Recorder" and "Magnet" are being fitted at Singapore, and the Company has now received instructions to equip the "Sherard Osborn" and prepare for shipment sets to be installed on board the CS. "Sentinel" on the West Coast Station, and on board the CS. "Cormorant," stationed at Monte Video.

The T.C. and M's CS. "Colonia," "Cambria" and "Telconia," the CS. "Buccaneer" of the India Rubber, Gutta Percha and Telegraph Works Company, and the CS. "Mackay Bennett" of the Commercial Cable Company, all carry standard 1½ K.W. sets, which have been used on many occasions with the greatest advantage in facilitating and expediting repairs.

NAVAL SHIPS

The Company has been favoured with instructions from the Portuguese Government to equip two of their Fleet, the "Admastor" and "Sao Rafael," with wireless sets.

Instructions have also been received for the "Vasco da Gama" to be fitted.

Orders were also placed by the Australian Commonwealth for the "Parramatta," "Yarra" and "Warrego," by the Argentine Government for the "Chaco" and "Pampa," and by the Canadian Government for the "Rainbow" and "Niobe."

TRAINING SHIPS.

Besides the White Star Line's Training Ship "Mersey," wireless sets have been installed on the training ships "Conway" and "Indefatigable," stationed on the Mersey, and the "Worcester" lying off Greenhithe. The "Arethusa," which is also lying off Greenhithe, is now being fitted.

SEALING VESSELS.

Previous to setting out upon this season's sealing expeditions, the SS. "Adventure," "Bellaventure," "Bonaventure" and "Newfoundland," belonging to Messrs. A. Harvey & Company, were equipped with Marconi Apparatus.

PRIVATE YACHTS.

The SY. "Valhalla," owned by the Duke of Bedford, has been fitted at Cowes. The SY. "Sapphire," owned by Mr. Gould Brokaw, of New York, was similarly equipped.

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COMPULSORY WIRELESS TELEGRAPHY ON BOARD SHIP.

That Governments and the public generally now recognise that wireless telegraphy is vital to the safety of ocean-going vessels is clear from the action which has, during the past few months, been taken by several of them to make installations of wireless telegraphy compulsory on ocean-going passenger vessels. The requisite powers were taken by the New Zealand Government by means of a clause in the New Zealand Shipping and Seamen Amendment Act of 1909, which reads :—

"The Government may, from time to time, by order in Council, make regulations requiring ships registered in New Zealand and carrying passengers to be provided with apparatus for transmitting messages by means of wireless telegraphy, and may by such regulations prescribe fines not exceeding fifty pounds for any breach thereof by the owner or master of a ship."

In Italy also powers have been taken by the Government to compel vessels carrying emigrants and calling at Italian ports to carry Marconi Wireless Apparatus.

An Act passed by the Senate and House of Representatives of the United States of America provides that "from and after the first day of July, 1911, it shall be unlawful for any ocean-going steamer of the United States, or of any foreign country, carrying passengers and carrying fifty or more persons, including passengers and crew, to leave or attempt to leave any port of the United States unless such steamer shall be equipped with an efficient apparatus for radio-communication, in good working order, in charge of a person skilled in the use of such apparatus, which apparatus shall be capable of transmitting and receiving messages over a distance of at least one hundred miles, night or day. Provided, that the provisions of this Act shall not apply to steamers plying only between ports less than two hundred miles apart."

Bills of a similar nature are now under consideration in Canada and the Argentine.

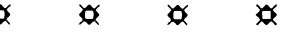
An order was promulgated by the Austrian Government on 8th November, 1910, decreeing that Austrian merchant vessels keeping up a passenger service from Austrian ports beyond Gibraltar or Aden, should on regular voyages be fitted with radio-telegraph stations.

These stations have to conform with regard to their installation, their working (or service) and their operating staff with the Regulation of the Ministry of Commerce of the 7th January, 1910, Reichsgesetzblatt, No. 11, and under normal conditions they have to guarantee an exchange of messages on a distance of at least 100 nautical miles, and above all, they are to serve for communication, without any discrimination as to system, with coast and ship stations in matters of the captain's orders regarding rescue work or safety precautions.

This regulation comes into force one year after its proclamation.

THREE THOUSAND LIVES SAVED BY WIRELESS.

That wireless telegraphy has become an important adjunct of the life-saving service is demonstrated by the following announcement which recently appeared in the "Telegraph and Telephone Age." A rough calculation has been made recently as to the success and value of the assistance rendered by wireless telegraphy to ships at sea in the saving of life, and it is estimated that 3,000 persons owe their continued existence at the present time to the help rendered by wirpless telegraphy.



The Marconi Company of America has received instructions to install Marconi apparatus on the SS. "British Sun," a tank steamer carrying oil across the Atlantic and between Galveston and Philadelpha, owned by the British Sun Company.

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THE MARCONIGRAPH

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A Word of Thanks.

We wish to express our thanks to both the public and the Press for the cordial reception accorded the first number of *The Marconigraph*.

Many letters of congratulation have been received from readers, which unfortunately owing to limitation of space we are unable to reproduce in this number, but as some indication of their general trend we quote the following paragraph which appeared in *Syren and Shipping* :—

"With the constant extension of Wireless "Telegraphy it was of course inevitable "that a Journal devoted to matters con- "nected with that method of communica- "tion should come into existence. Such "an organ has now made its appearance, "and appropriately enough it is to Mar- "coni's Wireless Telegraph Company, "Limited, that its reception is due."

A Note on the Month's News.

In the present issue we have given an article on the Wireless Installations on the Upper Amazon. The notes were supplied by the Engineer in charge of the operations, and the article illustrates some of the many difficulties that have to be overcome before these installations in remote parts of the world are carried out.

We also publish an account of a Sealing Expedition as related by one of the Marconi Officers, who made the voyage on the SS. "Florizel," which demonstrates one of the many uses to which Wireless Telegraphy has been applied.

The other short articles and notes of recent happenings in the Wireless World will no doubt prove of interest to all.

On the technical side, we have reproduced, with the kind permission of the Physical Society of London, Dr. Fleming's paper on "The Measurement of the High-Frequency Resistance of Wires," which, it is believed, will prove both interesting and instructive.

Increase to 24 Pages.

Since the appearance of the initial number of *The Marconigraph*, it was found necessary to increase the number of pages in the present issue to twenty-four, and it is anticipated that this enlargement will be permanently maintained.

Arrangements have been made for the publication month by month of a series of articles, illustrated by photographs, relating to the erection of the wireless stations in various parts of the world.

It is also intended to include in *The Marconigraph* from time to time notes by Dr. Fleming and other eminent scientists.

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COLONEL ALBERT THYS.

Adolf Ecksteins Verlag, Berlin, W. Mohren str 8.

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THE MARCONIGRAPH

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by

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NOTES.

Colonel Albert Thys, whose photograph we reproduce this month, is chairman of the Belgian Wireless Telegraph Company (La Compagnie de Télégraphie sans Fil) and a director of the recently formed German Wireless Telegraph Company (Deutsche Betriebs Gesellschaft für drahtlose Telegraphie m.b.H.).

Col. Thys is a reserve officer of the General Headquarter Staff of the Belgian Army and first made his name some twenty-five years ago when he was instrumental in having built the railway that runs from the coast of the Belgian Congo up to Léopoldville, from which town the whole of the interior was opened out by river communication. He was also the founder of the Banque d'Outremer and has been closely connected with a very large number of colonial and industrial concerns, amongst which we need only mention the Compagnie du Katanga, the Chinese Engineering and Mining Company, and the Shanghai Construction Company, these three companies being specially well known in England.

Col. Thys has been intimately associated with wireless telegraphy ever since its inception as a commercial possibility, and his great influence and untiring efforts have contributed very largely to establishing its use in European countries.

* * * *

The Marconi Companies have just concluded an important agreement with the French Government, whereby, *inter alia*, French ships may, irrespective of the wireless system installed on their boats, communicate with Italian coastal stations and all Marconi coastal and ship stations. The effect of this agreement will no doubt prove of great advantage to both parties and strengthen the good relations already established between the French authorities and the Marconi Companies.

* * * *

The annual meeting of Marconi's Wireless Telegraph Company of America was held on April 27th, and it is interesting to note that Mr. Godfrey C. Isaacs, Managing Director of the Marconi Company in London, was added to the board of Directors; Mr. Charles A. Terry of New York and Major S. Flood Page of London were re-elected directors to serve for a term of five years.

* * * *

At a meeting of the Board of the Marconi International Marine Communication Company, held on May 2nd, Mr. Guglielmo Marconi resigned his position as Managing Director, and Mr. Godfrey C. Isaacs was appointed in his stead.

* * * *

The Imperial Conference and Wireless Telegraphy.

An important item to be discussed at the Imperial Conference which opens on May 22nd is the proposal of New Zealand for an Imperial Wireless Telegraph system.

We hope to give a report of the proceedings in our June issue.

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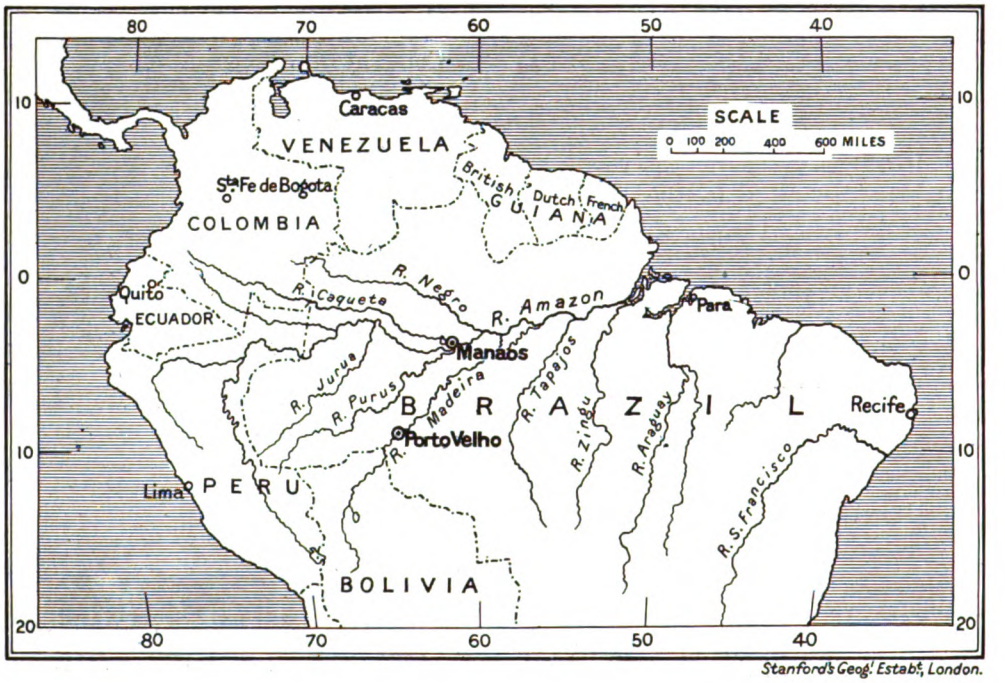
WIRELESS TELEGRAPHY ON THE UPPER AMAZON.



Stanford's Geog! Estab!, London.

IT is one of the chief features of the wireless telegraphy system, and one which goes far towards contributing to its great success, that owing to its simplicity, it can be installed in regions which present the greatest difficulties to the overhead and underground telegraphic cable systems, difficulties which have very often proved to be insuperable, with the result that not a few remote parts of the world have been compelled to forego the use of telegraphy—to do without that greatest aid to modern life. But wireless telegraphy is altering all this. Day by day new districts are being brought within its scope; before very long there will be few large stretches of territory in the world that will not be linked up by means of wireless telegraphy; few stretches, at any rate, where the application of the system is warranted by commerce and population, or the potentialities for such.

It will come as a surprise to many people, perhaps, to learn that wireless telegraphy has penetrated to the upper Amazon, that river of rivers, and that at the present time it is playing a great part in opening up a vast region to the outer world which, until almost recently, was scarcely known by name to Europe. From the time when, nearly 400 years ago, the courageous Orellana descended the Andes on the eastern side, struck the head waters of one of the main tributaries of the Amazon, and sailed therefrom to the coast, until September, 1850, when the Emperor, Dom Pedro II., of Brazil, sanctioned a law authorising steam navigation on the Amazon, later opening the greater portion of it to all flags, the river was *aqua incognita;* now it is a busy scene of international traffic, ocean-going steamers from all parts of the world, and flying all flags, crowd its waters, and on its banks are ports equal to many a well-known port in Europe.

Of these, Para, near the entrance, and Manaos, almost halfway up the main river, and situated in the heart of the country, are the best-known, and Manaos has come to be the great depôt for the

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collection of the produce of the upper Amazon. Thence it is shipped down the river to Para, or direct to European and American ports, and the importance of Manaos may be realized, when one learns that in 1907 the total arrivals at the port were 1,589, of which 133 were ocean-going steamers from Europe and the United States, and 75 from south Brazilian ports. Manaos is connected by cable with Europe; but here cable communication ends, and the regions above it, on the various large tributaries of the Amazon, are cut off from rapid communication. One of the principal of these extends from Porto Velho, on the Madeira, downwards to Manaos. The Madeira begins at the confluence of the Guaporé with the Mamoré, and it is a river of great potentialities, in that it taps the rich and luxuriant region which lies at the foot of the Andes on the eastern side, along the lower portion of Peru, and the borders of Bolivia. In fact, it may be said to be the great natural highway for the conveyance of the products of a third of the State of Bolivia, to the port of Para. But for a distance of 210 miles, from Guajara Mirim to Porto Velho, the river is beset with rapids, which make navigation extremely hazardous. To overcome this difficulty, however, a railway Company, known as the Madeira-Mamoré Railway Company, has constructed a line 210 miles in length, along the "rapid" portion of the river, and by this means (a portion of the line is already constructed and working) goods will be conveyed to Porto Velho, and forwarded thence by river to Para.

This railway company, being exceedingly enterprising, hit upon the idea of connecting Porto Velho and Manaos by means of wireless telegraphy, thus bringing Porto Velho within the bounds of the most advanced civilization, and accordingly the Marconi Wireless Telegraph Company were instructed to fit up two wireless stations, one at Manaos, the other at Porto Velho. The work has been completed, long since, and at the present time the upper Amazon, from Porto Velho to Manaos, is within the wireless circuit. It may be found of interest to learn how the work of installation was accomplished, and the nature of the plant erected, and for this purpose we publish the notes of one

Brazilians clearing space for the Site selected for the Manaos Station.

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of the engineers who was engaged upon the work, and who proceeded from England to Para, and up river to Manaos and Porto Velho.

He says: "After a long tiring journey across the ocean, owing to the intense heat, the prospect of the journey up the Amazon grew very attractive; interesting it could not fail to be, seeing that we were about to ascend the river which has the greatest volume of water of any river in the world, and one which was for many years, and is now, to a certain extent, the home of mystery, for that which is unknown is ever mysterious, or deemed so. And yet, despite all this, the journey was monotonous; at times uninteresting. After all, all rivers are very much alike, and all have their interesting and their uninteresting portions. Exclude all ideas as to latitude and longitude, shut out the vision of mediæval junks, with shining brass cannon, and yellow, oval mongol faces peering at you from the decks thereof, and at one or two places you have, on the Woosung River, going up to Shanghai, a glimpse of Father Thames.

"From Para, which is growing to be a very great port, and which has enormous possibilities, for with Brazil lies the future, the steamer passes to the main stream of the river, through a section termed 'The Narrows.' Here the river-craft thread their way between picturesque islands, and in places the waterway is such that the sides of one's vessel are almost scraped by the boughs of trees, which o'erhang the river in luxuriant masses of various and delicate shades of green. Occasionally the channel widens, but at the widest part one could throw a stone to the shore. On many of the islands we pass, fine tall trees are to be seen, several with a uniform height of 80 feet or so. To me, the timber seemed to be poor, on the whole, but here and there a good specimen showed itself, its fineness rendering it conspicuous among the poorer of its kind. The river was in flood, and we saw it, therefore, at its busiest. Quite a number of craft, of various kinds, we passed, and here and there on the river banks, houses of primitive description stood; and in places, small settlements. The houses, if one can term them such, were of the usual wood and leaf construction, the floor being carried some feet above the level of the ground, to avoid flooding. In these small homesteads live the people of the country, generally of Indian or mixed blood, making a living by collecting wild rubber from the trees growing near, cultivating the indispensable manioc, and fishing in the waters everywhere at hand. Later we pass farms under water, with cattle thereon wading and swimming in search of food.

"Once through 'The Narrows,' and we steam out into the wide expanse of the main stream, and from this point on to Manaos the journey becomes less interesting. The country is very flat and it is thickly clad with trees; soon the lack of variety begins to tell on one. The 'sameness' of the Amazon, if one may call it so, is like the 'sameness' of many another tropical river—the very wealth of vegetation grows monotonous, bare banks and an inland view are longed for, and one begins to abominate the never-ending prospect of trees, trees, trees. Except when one is passing at the flowering season of most of the trees, there is little variation as regards their colouring. At the flowering season of the year, however, a brilliant scene may be witnessed, for so many of the trees flower like plants, and you have blossom in all notes of colour, from the rich red of the flamboyant acacia, to the yellows and whites of other arboreal orders. Our sense of pleasure was not increased by the presence of mosquitoes. True there were not many, not so many as we had been led to expect, and we took the precaution, a wise one, of sleeping in mosquito-proof bunks, but we were told that the mosquitoes which were present were of a particularly dangerous variety, hence a good deal of the discomfort they caused was of the anticipatory nature. As for the heat, it was very trying. During the day it was most severe, though the sun's rays on this part of the Amazon are not so deadly as they are in many other parts of the globe, owing to the humidity which prevails, but at nightfall relief came, for which one was truly thankful. The nights were often cold, and one enjoyed a warm blanket.

"The site which had been selected for the Manaos station was one about three miles west of the town, and about a mile east of the pumping station. The ground lies

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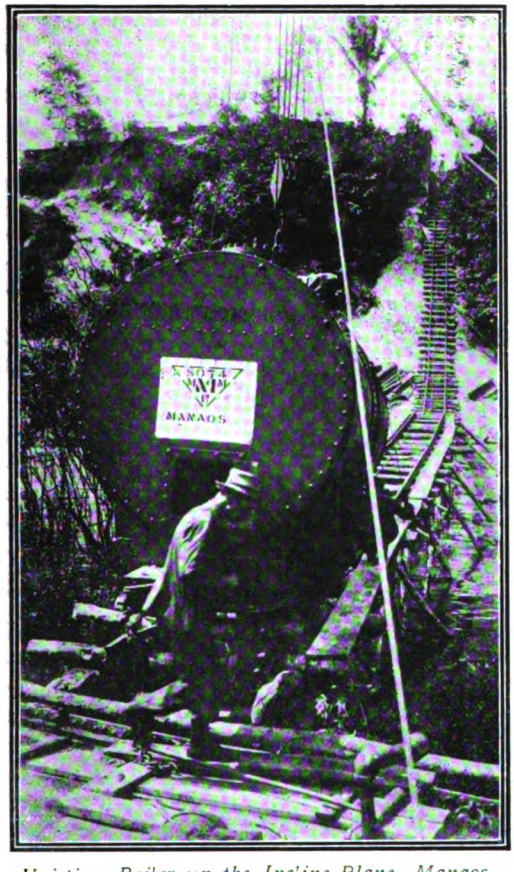

Hoisting Boiler up the Incline Plane, Manaos.

about a quarter of a mile back from the river bank and fronts the river. The bank here rises to a height of 60 feet above high-water mark, and it was necessary, therefore, to cut an outlined plane down the face of the cliff and lay a track up from the water's edge to the site of the Power House. All materials had to be brought by lighter from the town, unloaded at the foot of the track, hoisted up the inclined plane, and sent down to the Power House. The great difficulty to contend with was the variation in the height of the river, the fluctuation from high to low water amounting to from 30 to 35 feet. Our track was constructed approximately at high water, and according as the river became lower, it had to be extended. As the water dropped, the bank did not keep to its almost vertical slope, but commenced to slide rapidly, so that before all the material could be unloaded, the track had to be extended on trestles.

"The station we erected at Manaos is equipped with two 70 K.W. 2,000 volt A.C. generating sets, driven by belting from steam engines. The transmitting aerial is suspended by four steel masts, each 217 feet high, the receiving wire being carried over them to a short mast 65 feet high at the receiving house. This station is built to connect with a similar one at Porto Velho, on the Rio Madeira, with a 5,000 word per day capacity, and after its installation had been completed, we journeyed on to Porto Velho by steamer, to undertake the installation there. The journey from Manaos to Porto Velho occupies from eight to thirty days, according to the state of the river, since at low water boats can proceed by day only, and even then must make their way very carefully, to avoid the many sand-banks and shallows. Occasionally a boat grounds and is compelled to wait, ignominiously, where she has struck, until another craft comes along and hauls her off, the mosquitoes having descended upon her and her living freight meanwhile, to the disgust and discomfort of the latter, whose only recreation consists in attempting to bag some of the many alligators which are basking, like themselves, on the mud-banks.

"At Porto Velho, the site chosen for the wireless station was on what used to be known as Cascalha Hill and was the railway camp: now its name has been changed to Wireless Hill: thus does the Marconi System make geography! Our material was unloaded and brought to the foot of this hill by the Madeira-Mamoré Railway Company, for which company we were erecting the two stations, and we had to haul it up, and on to the site. All difficulties were overcome speedily, and the station, one similar in all respects to that we had erected at Manaos, was soon completed. Singularly, one of its first performances was to announce the opening of the first section of the Madeira-Mamoré Railway to Manaos, and since then it has proved of immense benefit to the railway company in their arduous undertaking of opening up trade communication between Eastern Bolivia and the outer world. When the river Madeira is full, ocean-going steamers occasionally steam up to Porto Velho, and captains of such

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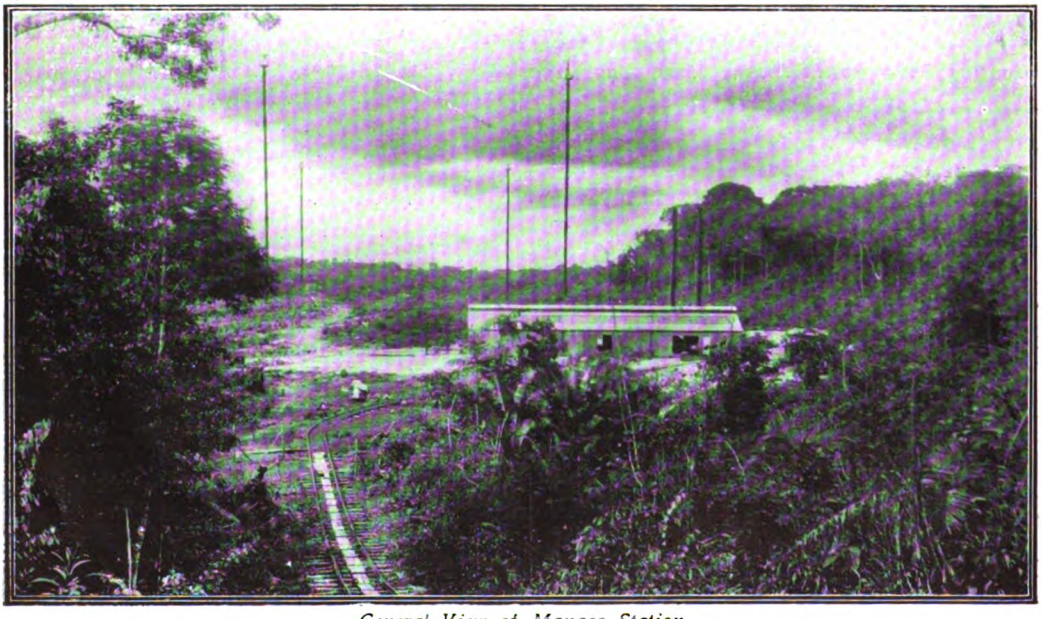
vessels have found the wireless system of great aid to them in communicating with their agents or owners. Wireless should play no small part in increasing the importance of Porto Velho, and in aiding to make it the great trade head-quarters for the territory fed by the Madeira and its tributaries.

"The following details as to the Power House, etc., at the two stations (each is the same as the other) may prove of interest: The Power House is a steel frame galvanised iron building, extending over an area of 100 ft. by 30 ft. It has two 100 H.P. boilers, of the economic return tube marine type, situated so that the doors are, approximately, on the centre line of the building, giving the fireman ample room in front of the furnace for stoking and cleaning; the bunkers run along the end of the building, and alongside the boilers. Two Mumford steam pumps are provided, fitted so that either or both may be used for the supply of water to either or both boilers. At Manaos, these pumps take their water from a 60,000 gallon reservoir, which was built beside the Power House and is kept full by an electric motor-driven pump, lifting water from a well sunk about a hundred yards from the main building. Water was found in the dry season a few feet below the ground at this point, but it was not considered sufficiently reliable as a permanent source, so the well was sunk some twenty feet deeper, when a second layer of water-containing gravel was struck, immediately above a strata of white clay. The well was sunk as far as this, and it has resulted in a good supply of water, which is always available. Besides this source of supply, the gutterings of the building are all constructed so that they drain into the reservoir, and the amount of water collected in this manner is more than sufficient to compensate for that used by the boiler during the rainy season. At Porto Velho, the railway people have provided a main from their camp water supply, obviating the necessity of constructing a reservoir, well and pump.

"The boilers are connected with a single steam main, which feeds both engines and pumps. The engines are in the second, or main division of the Power House. Besides the engines, this room contains the alternators and switchboard, and a work bench. The engines are compound, by Davey



General View of Manaos Station.

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Paxman and Company (horizontal slow speed compound Colchester type), each capable of delivering 100 B.H.P., at 120 revolutions per minute. Each has a seven-foot fly wheel, on which is laid the belting which transmits the power to the alternator. The alternators, built by the E.C.C., are two in number, and each is capable of delivering 70 K.W., at 2,000 volts, 50 cycles, when run at 600 R.P.M. The alternator sets are right and left hand, corresponding to the engines, and are mounted on separate beds, with the adjacent faces machined up so that if necessary the two beds and the two alternators, which are provided with shaft extension and half couplings, may be bolted together, and the whole plant run as one unit.

"The switchboards are divided into two groups, one for the D.C. and one for the A.C. machines. Each alternator feeds three transformers, each capable of going 25 K.W., at 20,000 volts, when supplied with single-phase alternating currents at 2,000 volts. Thus it will be seen that the generating plant is duplicated throughout, the station working on one set and having the other as a stand-by. As a matter of fact, owing to the damage done to the Porto Velho transformer in transit, only one transformer was able to be worked when the plant was operated first, and communication was maintained for more than a month in this manner.

"The transformers are in the third and last section of the Power House. In this room the high tension electro-magnetic relay switches, the various tuning inductances, the motor-driven disc discharger, condenser, jigger and aerial tuning inductances, are situated. The high tension relay switches are worked from the Receiving Room by the operator on duty there. The condenser stands are built to accommodate the Poldhu type condensers, and are divided into two groups, with the disc discharger between them. This discharger is a 24-inch eight stud standard type disc, directly connected, through an insulating coupling, to a 10 B.P., 220 volt D.C. motor, built to run at 3,000 R.P.M. The side electrodes of this disc are cup pattern, and are revolved by insulated gearing, driven through a worm gear on the end of the disc shaft. The jigger is a modified high-power one. The connection to the aerial is made through a leading in insulator, set on to the end of the building. The transmitting aerial is suspended by insulated wires from steel masts. The outer pair of masts is 220, and the inner pair 200 feet high.

"The earth system is made of a number of metal plates buried in proximity to the Power House, and a system of radial wires laid on the surface of the ground under the aerial, extending from a stream beyond the free end of the aerial, back to the Power House, and from the Power House to the river. The two receiving wires are suspended over the transmitting wires and run from each outer mast, past the main pair of masts and the Power House, to a short sixty-foot mast, which is erected beside the Receiving House. The Receiving House is a small galvanised iron building, covering an area of 20 by 10 feet, and it is divided into two rooms; the Instrument Room contains the magnetic detector and the valve receiver. From this house the whole of the wireless work is transacted, since the manipulating key in this building controls the relay switch in the wireless room at the Power House and regulates the discharge of the transmitting condenser, in accordance with the reorganised groupings of the Morse code."

* * * *

The Governor of Colombo, at a recent meeting of the Council, said that Ceylon's Wireless Station, which is to be placed at Colombo, is calculated to make considerable changes in the working and potentiality of the port.

* * * *

It was announced by Mr. Thomas, the Postmaster-General of Australia, that the Federal Government has decided to appoint a British officer to organise and develop a wireless telegraphy system in the Commonwealth.

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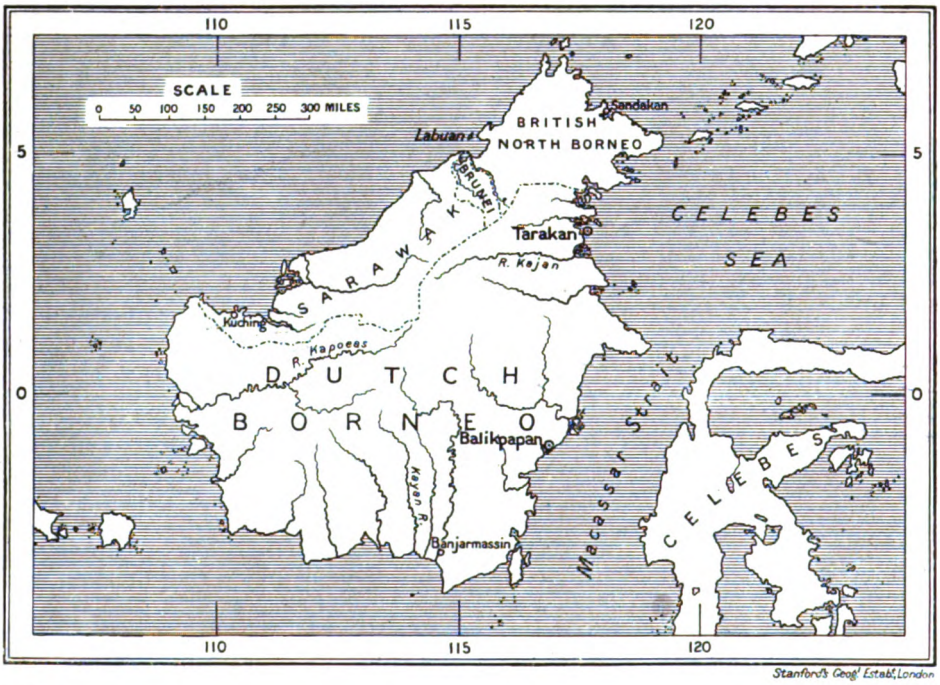
WIRELESS TELEGRAPHY IN BORNEO.



TARAKAN, the port in Borneo from which the products of the Bataafsche Petroleum Company's oil fields are shipped, is about to be placed in wireless telegraph communication with Balik-papan, already served by the German-Dutch cable system. The Balik-papan station will be the larger and more powerful of the two, for the reason that, in addition to the communication required with Tarakan, 300 miles distant, it has also to work with stations to be erected at Sitoe-Bondo on the Island of Java, 430 miles away, and at Koepang on the Island of Timor, a distance of 660 miles.

A multiple T type aerial, supported by five tubular steel masts, will be employed, and it is interesting to note that the central mast will be 250 feet high, which will constitute a record height for this style of mast.

Power is being provided by the Petroleum Company in the form of two-phase alternating current at 2,000 volts and 50 cycles, and will be transformed into single-phase current with similar characteristics, by a direct-coupled motor-generator set.

In other respects the station will be of the Marconi Company's 30 K.W. standard type, embodying the disc transmitter for the production of a musical note in transmission; the magnetic detector and tuner for reception.

The Tarakan station will be furnished with a semi-directional aerial of the multiple L type, supported by a mainmast of the same size and type as that at Balik-papan and two extension masts, each 150 feet high.

A 20 H.P. slow speed, horizontal, electric light type Gardner oil engine will drive by belt a 13 K.W., 200 cycle, E.C.C. generator and the usual Marconi disc.

It may appear that generously proportioned stations have been provided. Tarakan is not, however, ideally situated from the wireless point of view; high mountains occur between it and Balik-papan, and the equator just about equally divides the distance between them. Atmospheric disturbances, therefore, are not likely to be conspicuous by their absence.

The plants for both stations have been

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arranged for operation on a wave-length of between 8,000 and 9,000 feet for ordinary communication between them. Provision has also been made for the use of wave-lengths of 1,000 and 2,000 feet, in order that the stations may conform to the Service Regulations of the International Radio-telegraphic Convention governing wireless telegraphic communication with ships, and it is hoped that no little business will be done in this direction.

Mr. S. Kos is to be relieved of his work at Slangkop, Capetown, and will assume charge of the erection of the Borneo station. His assistant, Mr. Jones; the mast expert, Mr. Post, and Messrs. Magnee and Meyer, Dutch telegraphists, are already on their way out, and some six months hence should see the Balik-papan and Tarakan stations in working order.

The Turkish Contract.

The Marconi Company have been favoured with a contract from the Turkish Government, for the equipment of eleven ships stations and one shore station.

The Company's 3 K.W. sets will be installed on the following four vessels: "Messoudieh," "Abdul Hamadieh," "Medjich," and "Tiri Migglian," while the "Perki Scheekit," "Barki Satvet," "Bassora," together with four torpedo boat destroyers, will be fitted with standard 1½ K.W. ship sets. The former vessels will have a range of 600 K.M., and the latter 250 K.M.

The land station is to be erected at Constantinople, and will be of 20 K.W. with a range of 1,000 K.M., and to transmit five wave lengths ranging from 600 to 2,000 meters.

A Coltano type mast 250 feet high, with six extension masts, each 110 feet high, will be used to suspend the aerial. The generating plant consists of a 55 B.H.P. Gardner vertical high-speed oil engine, coupled to an E.C.C. dynamo. The station will have a Tudor Accumulator Battery, which has a capacity of 900 ampere hours, and power will be supplied by a direct coupled alternator disc set, having an output of 20 K.W. at 1,000 volts and 300 cycles when driven on 1,500 R.P.M. The station will have both valve and magnetic detection receivers.

The erection of the station has already commenced, and the work is being carried out under the supervision of Mr. Cole of the Engineers' Department.

During the erection of the Admiralty station at Wick, which is now almost completed, secrecy has been maintained throughout the progress of the work. The installation is part of the equipment for the proper direction of the manœuvres of the different fleets to be concentrated at the Scapa Flow, and Cromarty Firth naval bases.

* * * *

It is said by the *Edinburgh Evening News* that the Admiralty have been prospecting on various commanding sites along the Haddingtonshire Coast on which to erect a signalling station, equipped with wireless telegraphy, etc., and it is understood that the Naval authorities have settled on ground located on the high altitude between Seacliffe and North Berwick. Ground will be leased there, and very possibly operations will proceed at once. Rosyth Naval Base has made this station necessary.

* * * *

The Marconi Wireless Telegraph Company of Canada, Limited, have received instructions from the Newfoundland Government to proceed with the erection in the summer of two small power stations on the Labrador, at Makovick and Cape Harrison.

* * * *

A new Wireless Station is being erected under the control of the Military Authorities of the Italian Army, at Bologna. The apparatus consists of the Marconi 5 K.W. standard type installation, which will have an effective working range overland of about 180 miles. The station is to be employed solely for military purposes.

* * * *

The Italian Government Wireless Station at Becco di Vela has been closed and a new station at Taranto with a range of 500 kilometres is to be opened to public service on the 15th May. On and after that date the Government Wireless Stations at Capo Mele and Capo Sperone will be opened day and night for public service.

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A NOTE ON THE EXPERIMENTAL MEASUREMENT OF THE HIGH-FREQUENCY RESISTANCE OF WIRES.

By J. A. FLEMING, M.A., D.Sc., F.R.S.,
Professor of Electrical Engineering in University College, London.

Reproduced from the "Proceedings" of the Physical Society of London, Feb. 15th, 1911.

In a paper read to the Institution of Electrical Engineers in December, 1909, the author described an apparatus for the measurement of the high-frequency resistance of wires with which many additional experiments have been made lately in the Pender Electrical Laboratory, introducing one or two little improvements which have conduced to greater accuracy.* The apparatus as originally described consisted of a pair of glass tubes T_1T_2 having bends at the bottom full of mercury and closed by air-tight stoppers at the top and bottom (see Fig. 1). These tubes are connected by a lateral inverted syphon made of barometer tube having in it some paraffin oil with an air bubble (*b*) in the centre. The arrangement therefore forms a differential air thermometer and the air bubble serves to show whether the air pressure in both the large tubes is the same. The vertical tubes are about 30 in. in length and 1·5 in. in diameter. In each tube is placed one of two exactly equal wires (W) to be tested. The wire is supported from a copper rod passing air tight through a rubber stopper and the bottom end attached to another copper rod hangs in the mercury in the lower bend by means of which an electric current can be passed through the wires.

Means are provided by a condenser, inductance and discharger for generating electric oscillations of any desired frequency. Also means for passing a continuous current of any strength through either wire. By means of throw-over switches (P_1P') the high frequency or the continuous current can be passed through either wire in the tubes and measured by means of suitable high-frequency hot-wire ammeters, A_1A', as described in the Author's previous Paper (*loc. cit.*). Neglecting for the moment some necessary corrections, the experiment made consist in passing a continuous current through one wire and a high-frequency current through the other similar wire and adjusting them until the rate of production of heat in both cases is the same, when a steady condition is reached, as shown by the indicating bubble remaining stationary. If R is the steady resistance of the wire and R′ is its high frequency resistance, and if A and A′ are the equi-heating values of the continuous and high-frequency currents respectively, then for thermal equilibrium we have $A^2R=A'^2R'$, and therefore $R'/R=A^2/A'^2$.

One essential condition of success is that the high-frequency current must be measured

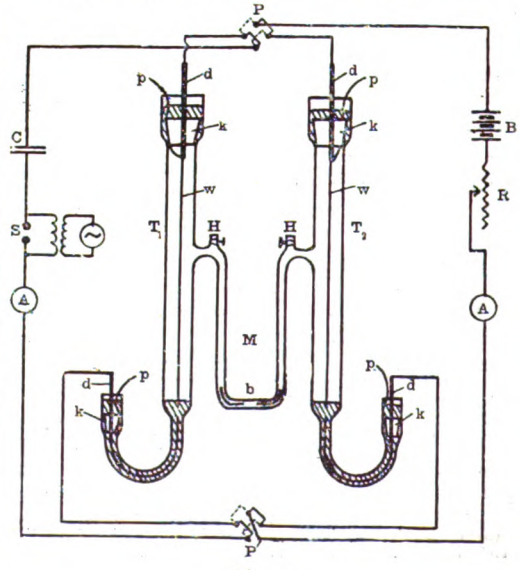

Fig. 1.

* *See* J. A. Fleming. "Some Quantitative Measurements in Connection with Radio-telegraphy." "Proceedings of the Institution of Electrical Engineers," London. Vol. XLIV., p. 349, 1910.

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by an ammeter capable of giving the true root-mean-square value. Such an ammeter has been described by the author in detail in the Paper referred to as read before the Institution of Electrical Engineers.*

There are, however, a number of precautions to be taken in using the apparatus. In the first place, although the wires tested and the tubes in which they are placed are as nearly alike as possible, the conditions of loss of heat are not absolutely the same. There may be a small difference in the emissivity of the wires due to difference in polish, also a difference in superficial area. Again the glass tubes may not absorb or radiate heat quite equally; and therefore the rate of loss of heat from the wires is not quite the same.

Supposing then that currents are passed through the two wires such that the bubble remains at rest it shows that the air-pressure in the two tubes is equal, and therefore that the air in the two tubes has the same mean temperature. If the experiment is continued until a steady state is reached the rate at which heat is being removed from each wire is proportional to some constant depending on the nature of its surface and some function of the mean temperature of air in the tube. Hence, if we pass a continuous current, A_1, through one wire and a high-frequency current, A′, through the other, and if t_1, is this mean temperature in both tubes when the bubble is at rest we shall have

$$\begin{aligned} A_1^2R &= e_1 f(t_1), \quad . \quad . \quad . \quad . \quad (1) \\ A'^2R' &= e_2 f(t_1), \end{aligned}$$

where e_1 and e_2 are constants appertaining to each wire and $f(t_1)$ is some function of the mean temperature of the surrounding air.

Again, if we cause the high-frequency and the continuous current to change wires and vary the value of the continuous current until we again reach a steady state, at which the mean temperature of the air in the tubes is t_2, and if A_2 is the continuous current required to thermally equilibrate the same high-frequency current A′, we have

$$\begin{aligned} A_2^2R &= e_2 f(t_2), \quad . \quad . \quad . \quad . \quad (2) \\ A'^2R' &= e_1 f(t_1). \end{aligned}$$

From (1) we have

$$\frac{R'}{R} = \frac{e_2}{e_1}\left(\frac{A_1}{A'}\right)^2 . \quad . \quad . \quad . \quad (3)$$

and from (2) we have

$$\frac{R'}{R} = \frac{e_1}{e_2}\left(\frac{A_2}{A'}\right)^2 . \quad . \quad . \quad . \quad (4)$$

Hence from (3) and (4) we have

$$\frac{R'}{R} = \left(\frac{\sqrt{A_1A_2}}{A'}\right)^2 . \quad . \quad . \quad (5)$$

In other words, if we equilibrate the same high-frequency currents by continuous currents A_1 and A_2, changing wires in the two measurements, then the ratio of the high frequency to the steady resistance is equal to the ratio of the product of the two direct currents to the mean square value of the high-frequency current. In the former experiments we assumed that the arithmetic mean of the two continuous currents should be used, but it is clearly more correct to take the geometric mean. Against the former experiments on this subject the criticism was made that the calculated value of the high-frequency resistance with which the observed value should be compared should be the high-frequency resistance to damped oscillations which, as Dr. E. H. Barton has shown, is somewhat larger than the high-frequency resistance to persistent oscillations or undamped high-frequency currents.* This correction is a small one, though not absolutely negligible. Hence, in the above formula R′ must be understood to mean the resistance to such oscillations as are employed in the experiment. Also it was asserted that the heating effect due to the high-frequency current was partly due to the charging current of the condenser used.

This last is, however, a quite negligible source of error. The condenser used was a battery of Leyden jars, which, when charged and discharged, gave trains of oscillations, each having about 30 to 50 oscillations or so, as proved by the decrement in that circuit. Hence the actual charging current of the condenser is not more than 3 per cent. or so of the oscillatory current at the most, and its mean-square value is not more than

* This hot-wire thermo-electric high-frequency ammeter is now being manufactured by Mr. Robert Paul, of Newton Avenue Works, New Southgate, London, N.

* *See* Dr. E. H. Barton "On the Equivalent Resistance and Inductance of a Wire to an Oscillatory Discharge." "Proc. Phys. Soc., London," 1899, Vol. XVI., p. 409, or "Phil. Mag.," 1899, Vol. XLVII., p. 433.

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about 0·1 per cent. Moreover, the resistance on which the low-frequency charging current operates is the ordinary or steady resistance of the wire, whilst the resistance to the oscillatory current is the much greater high-frequency resistance. Hence, any correction under this heading is negligible in comparison with other sources of error.

The greatest practical difficulty is to secure a sufficiently steady high-frequency current. This was generated by employing a motor-driven alternator to give current to a large high-tension transformer raising the potential of an alternating current having a frequency of 50 to a potential of 10,000 or 20,000 volts. This voltage was used to charge one or more Leyden jars, which were discharged across a spark-gap, an air-blast on the gap being used to steady the discharge. The frequency of the oscillations so created was measured in each case by a cymometer, and the mean-square value of the current by one of the Author's hot-wire thermo-electric ammeters.

The voltage of the alternator could be regulated by a resistance in its field so as to alter the number of spark discharges per second. The wires inserted in the tubes for test had in all cases potential wires attached to their ends brought out separately through the stoppers. The purpose of these was to enable a measurement of the resistivity of the wires to be made *in situ* and at the temperature actually used. The experiments were conducted as follows: The two wires of identical materials were selected and cut the right length, and, having been cleaned, the diameters and lengths were carefully measured. They were then attached by solder and screw clips to the holders and inserted in the tubes. After the apparatus was rendered air-tight, continuous currents were passed through the wires and the current and volt drop down these wires measured with the potentiometer, the currents employed being of about the same value as those actually used in the thermal balance. These measurements gave the resistivity (ρ) of the wire. Thus, if A is the continuous current through the wire in amperes and v the volt drop down the wire of length l and section s, the resistivity is given by $\rho = sv/lA$. Generally speaking, a number of such measurements were made and a curve set out so as to be able to determine the proper value of the resistivity corresponding to any steady current used.

This having been done, the high-frequency current A′ was passed through one wire, say, in the left-hand tube, and a continuous current, A_1, passed through the right-hand wire and adjusted until the bubble in the inverted syphon remained at zero, after sufficient time had elapsed to allow the thermal state to become steady. The currents were then reversed, and the alternating passed through the right-hand wire and a continuous current, A_2, through the left-hand wire. The ratio of the product of A_1 and A_2 to A'^2 was then calculated, and this gives the ratio of the high frequency (R′) to the steady resistance (R) of the wire.

The wires tested in these experiments were circular sectioned straight wires of copper (No. 30, No. 16, No. 14 S.W.G.), tin, eureka and steel, and two spirals of No. 16 bare copper wire.

For each straight wire the value of the quantity $\sqrt{h} = \pi d \sqrt{\frac{n}{\rho}}$ was calculated, where d is the diameter in centimetres, ρ the resistivity in C.G.S. units corresponding to the mean value of the continuous current A used, and the frequency n of the oscillatory current A′. It has been shown* that if $\sqrt{h}$ has a numerical value in the above units exceeding, say, 10, then for such wires the ratio R′/R is given by a formula due to Dr. A. Russell,† which is nearly equivalent to

$$\frac{R'}{R} = \frac{\sqrt{h}}{2} + \frac{1}{4} + \frac{3}{32\sqrt{h}} - \frac{1}{16h\sqrt{h}}$$

For values of $\sqrt{h}$ in the neighbourhood of 10 and upwards the two first terms suffice.

On the other hand, if $\sqrt{h}$ is less than 10 or so, then the ratio R′/R must be obtained by the aid of a formula called the Ber and Bei formula, first given by Lord Kelvin and re-obtained and discussed by Dr. A. Russell.

In these calculations we have used Lord Kelvin's formula, because it has been reduced

* *See* J. A. Fleming, "The Principles of Electric Wave Telegraphy and Telephony," 2nd edition, p. 112, 1910, for references to the literature of this subject.

† *See* Dr. A. Russell, "Proc. Phys. Soc., London," Vol. XXI., 1909; also "Phil. Mag." Vol. XVII., p. 524, 1909, "On the Effective Resistance and Inductance of a Concentric Main."

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to numerical form for certain values of $\sqrt{h}$ or its equivalent by Dr. Magnus Maclean.* The values of R′/R for the non-magnetic wires for the values of the frequency and current employed have been accordingly calculated in Table given below.

The correction to be applied for the higher resistance of the wires to damped rather than undamped resistance has not been made in the calculated value of R′/R because the decrement of the oscillations was not observed in every case, but this correction can at most increase the calculated value by about 1 per cent. or less. Dr. Barton has shown that the correction to be applied to Lord Rayleigh's formula for the ratio of R′/R, which is the same as the first term of Dr. Russell's formula is multiplication by a factor $s\sqrt{s+k}$, where $s=\sqrt{1+k^2}$, and $k=\delta/\pi$, where δ is the semi-period decrement of the oscillations. Experiments made on similar circuits to those used in the case of these measurements showed that δ might be taken to have some value of the order of 0·04, and therefore $k=\delta/\pi$ of the order of $\frac{1}{80}$. Hence, for such a case, $s\sqrt{s+k}=1{\cdot}007$, or the correction is under 1 per cent. Since the value of R′/R obtained by experiment cannot be repeated with differences much less than 1 per cent. it has not been considered necessary to apply the correction to the calculated values of R′/R, but it can be seen that, as far as the present experiments go, it would, if applied, make the agreement with the observed ratio in some cases rather better and in others rather worse than it is without it. In any case, the conclusion to be drawn is that this experimental method furnishes a value for the ratio which is in very fair agreement with that predetermined by theory in those cases in which the latter can give us a value.

Table I.—*The Measurement of the High-Frequency Resistance of Certain Wires.*

Conductor tested.	Value of $\sqrt{h}=\pi d\sqrt{\frac{n}{\rho}}$	Frequency n.	R.M.S. value of the H.F. current in amps. $=A'$.	Value of the direct current in amperes which balances A′ thermally. Right hand tube $=A_1$.	Left hand tube $=A_2$.	Value of $A=\sqrt{A_1A_2}$.	Ratio of currents $\frac{A}{A'}$	Ratio of resistances $R''/R=(A/A')_2$. Measured.	Calculated.	Remarks.
Bare straight copper wire, No. 30 S.W.G. dia.=0·03149 cm.	2·415	1,080,000	1·75	1·79	2·48	2·11	1·21	1·45	1·45	Calculated from Lord Kelvin's formula $\rho=1{,}8000$ (measured).
Bare straight copper wire, No. 16 S.W.G. dia.=0·1626 cm.	12·77	1,080,000	5·80	13·1	17·0	14·92	2·57	6·62	6·64	Calculated from Dr. A. Russell's formula $\rho=1{,}730$ (measured).
Bare straight copper wire, No. 14 S.W.G. dia.=0·198 cm.	15·4	1,060,000	6·70	18·5	19·7	19·1	2·86	8·10	7·95	Calculated from Dr. A. Russell's formula $\rho=1{,}760$ (measured).
Bare straight tin wire, pure tin, dia.=0·0265 inch	2·79	1,060,000	1·85	1·93	2·04	1·98	1·07	1·15	1·13	Calculated from Lord Kelvin's formula $\rho=17{,}000$ (measured).
Bare srtraight Eureka wire, No. 26 S.W.G. dia.=0·019 inch	0·623	1.060,000	1·045	1·00	1·08	1·04	0·995	0·99	1·00	Calculated from Lord Kelvin's formula $\rho=23{,}500$ (measured).
Steel wire, 1·0% C. ... dia.=0·017 inch	$0{\cdot}906\sqrt{u}$	1,060,000	0·530	1·36	1·37	1·363	2·575	6·63	—	$u=196$ (calculated). $\rho=23.500$ (measured).
Steel wire, 0·8% C. ... dia.=0·0156 inch	$0{\cdot}906\sqrt{u}$	1,060,000	0·530	1·35	1·38	1·363	2·575	6·63	—	$u=196$ (calculated). $\rho=19{,}800$ (measured).
Spiral of No. 16 bare copper wire, 135turns turns per cm.=2·65	—	545,000	3·90	10·8	11·05	10·91	2·800	$R''/R=7{\cdot}82$	$R''/R'=1{\cdot}63$	value of R′/R calculated for $n=545{,}000$ by Russell formula=4·80.
Spiral of No. 16 bare copper wire, 135turns turns per cm.=2·65	—	750,000	3·90	9·8	10·15	10·0	2·517	$R''/R=6{\cdot}54$	$R''/R'=1{\cdot}2$	value of R′/R calculated for $n=750{,}000$ by Russell formula=5·54.

Accordingly, for straight wires of the

* *See* Lord Kelvin, Presidential Address, "Journal," Inst. Elec. Eng., 1889, Vol. XVIII., p. 35, and Appendix. Dr. Russell has shown that this Table requires recalculating, and some revised Tables have been published by Mr. H. G. Savidge, *see* "Proc. Phys. Soc., London," Vol. XXII., p. 105, 1910.

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magnetic metals, we have approximately the equation

$$\frac{R'}{R}=\tfrac{1}{2}\pi d\sqrt{\frac{\mu n}{\rho}}+\tfrac{1}{4},$$

and this equation can be used to find the value of μ when n, d and ρ are known and R'/R is experimentally determined. Observations were accordingly made with two steel wires of different carbon content about 1 per cent. and 0·8 per cent., using the same methods. It was found that the experimental value of R'/R corresponding to a frequency of $1{\cdot}06\times10^6$, came out in both cases the same, viz., 6·63. The diameters of these wires were respectively 0·017 in. and 0·0156 in., and the experimentally determined resistivities 23,500 and 19,800 C.G.S. units, hence $d\sqrt{\frac{n}{\rho}}=0{\cdot}906$ in each case, and we have the value of the permeability μ from the equation

$$6{\cdot}63=\tfrac{1}{2}\times0{\cdot}906\sqrt{\mu}+\tfrac{1}{4}$$

or $\mu=196$ for both wires.

Since the radius of the cross-section of each wire is nearly 0·02 cm., and since the root-mean-square value of the current is about 1·3 amperes or 0·13 absolute units, it is clear that the root-mean-square value of the magnetic force H at the surface of the wire is about 13 C.G.S. units. The value of the permeability above found, viz., 196, is a kind of mean value corresponding to an intermittent oscillating magnetic force, and not to any steady value of the magnetic force.

If a magnetic force of 13 C.G.S. units was steadily applied the permeability corresponding to it would be about 900 or 1,000 for such a steel as is here used. Hence we cannot infer from the static magnetisation curve the permeability corresponding to a high-frequency intermittent magnetising force any given R.M.S. value, since the actual permeability for such a magnetising force so applied appears to be always much less than for the equal steady force.

In the last place two experiments were made on the high-frequency resistance of spirals of copper wire. It is well known that a close spiral of wire of good conducting material has a larger high frequency resistance than the same wire stretched out straight. Hence, for such a spiral we have three resistances to consider, viz., its steady resistance R, its high-frequency resistance R' and its spiral resistance R". The ratio of R"/R can be determined in the above-described apparatus as easily as that of a straight wire.

A spiral of copper wire, No. 16 S.W.G., was made having 135 turns and 2·65 turns per centimetre of length. This was tested at two frequencies, viz., $n=545{,}000$ and $n=750{,}000$. In the former case R"/R was found to be 7·82 and in the latter 6·54. From the known value of R'/R for this wire at these frequencies it was found that R"/R' was for the lower frequency equal to 1·63 and for the higher 1·2. These values show that the ratio R"/R' appears to diminish with increase of frequency.

The subject of the high-frequency resistance of spirals has already engaged the attention of several mathematicians and experimentalists. The formulæ given so far for predicting it for high-frequency currents do not seem to be in good agreement with experimental results.

The latest investigation is that of Dr. J. W. Nicholson (*see* "Proc. Phys. Soc., London," Vol. XXII., p. 114, 1910, "On the Effective Resistance and Inductance of a Helical Coil"). He considers mathematically such a case as is here dealt with experimentally, namely, a circular-sectioned wire wound into a spiral of fairly close turns in one layer and traversed by a high-frequency current.

If a is the radius of the cylinder on which the spiral is wound and r is the radius of the section of the wire, and n is the number of turns in a length, z, of the spiral, then the angle a of the spiral is defined by $\tan a=z/2\pi na=\beta\pi D$, where β is the distance from turn to turn and D is the diameter of the spiral. When a is greater than $12r$, and the frequency greater than $4{,}900/r^2$, Dr. Nicholson arrives at an expression for the effective resistance of the spiral per unit length of the wire which he gives in the form (*see* his equation (46), p. 128, *loc. cit.*)

$$R=\left(\frac{\mu p\sigma}{2\pi r^2}\right)^{\frac{1}{2}}\left\{1+\left(\frac{\sigma}{8\pi\mu pr^2}\right)^{\frac{1}{2}}+\tfrac{3}{4}\frac{\sigma}{8\pi\mu pr^2}\right.$$

$$\left.-\frac{\sigma}{32\pi a^2}\cos^2a(1-5\sin^2a)\right.$$

$$\left.1+\left(\frac{\sigma}{8\pi\mu pr^2}\right)^{\frac{1}{2}}-\frac{9}{4}\left(\frac{\sigma}{8\pi\mu pr^2}\right)^{\frac{3}{2}}\right\}$$

where σ is the resistivity of the wire, μ the permeability, r the radius of section, and

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$p=2\pi n$, where n is the frequency. This expression can be simplified as follows: In place of his R put R″ since he uses R to denote the effective resistance per unit of length of the spiral wire, and I have here employed R to signify the steady resistance per unit of length. In place, therefore, of $\sigma/\pi r^2$, write R, since this is the steady or ohmic resistance per unit of length of the wire. Also take $\mu=1$, as we are dealing with non-magnetic wires, and in place of $\sigma/8\pi pr^2$ write $1/4h$, which makes $h=2\pi r\sqrt{\frac{n}{\sigma}}=\pi d\sqrt{\frac{n}{\rho}}$, as above; also write d for $2r$ and D for $2a$.

With these changes, Dr. Nicholson's formula becomes

$$\frac{R''}{R}=\left\{\frac{1}{2}\sqrt{h}+\frac{1}{4}+\frac{3}{32\sqrt{h}}\right\}$$

$$-\frac{1}{32}\frac{d^2}{D^2}\cos a(1-5\sin^2 a)\left\{1+\frac{1}{2\sqrt{h}}-\frac{9}{32h}-\frac{1}{\sqrt{h}}\right\}.$$

It will be seen that the first three terms in large brackets are the approximate expression, according to Dr. A. Russell's formula, for the ratio of the resistance per unit length of the wire for high-frequency currents to its steady resistance per unit of length, the wire being straight. This ratio is what we have called R′/R. Hence Nicholson's formula becomes

$$\frac{R''}{R}=\frac{R'}{R}-\frac{1}{32}\left(\frac{d}{D}\right)^2\cos^2 a(1-5\sin^2 a)$$

$$\left\{1+\frac{1}{2\sqrt{h}}-\frac{9}{32h}-\frac{1}{\sqrt{h}}\right\}$$

when d is the diameter of the wire and D of the spiral. If the angle a is small the term $\cos^2 a\ (1-5\sin^2 a)$ is nearly unity, and positive in sign, and if h is large the three last terms in large brackets are also not far from unity and positive.

Hence the formula clearly shows that for a value of a less than 26° 35′ R″/R should be *less* than R′/R by a small quantity. Now, this is contradicted by experiment. R″/R is always *greater* than R′/R, and the ratio of R″/R is as shown above, a quantity which is 1·63 or 1·2 for the spiral in question for the two frequencies 545,000 and 750,000.

Also the formula shows that when $a=\sin^{-1}1/\sqrt{5}=26°\ 35'$ R″/R=R′/R; and that when a is greater than 26° 35′, R″/R is greater than R′/R. The formula is, therefore, qualitatively wrong in certain cases and not in agreement with the results of experiment. The only case in which it agrees with observation as regards ratio of R″ to R′ is when the angle of the spiral is greater than 26° 35′, but this case has little or no practical importance, as the inductance coils of importance are mostly spirals of small angle.

Similar experimental measurements of the ratio R″/R′ made for copper spirals of the same kind by T. P. Black* in 1906 gave results of the same order as those obtained by me, viz., values between 1·2 to 1·89 for frequencies of 10^6 or that order and spirals made of wire 0·15 and 0·3 cm. in diameter.

It can be proved by elementary reasoning, as given by the author in the Paper read to the Institution of Electrical Engineers, that the spiralisation of a wire must increase its high-frequency resistance, and this is experimentally confirmed by the measurement here given and by all those of Black. There is no doubt that a fairly close spiral of many turns made of No. 16 copper wire has a resistance to high-frequency currents with frequency $\frac{1}{2}10_6$ to 10^6, which is from 1·5 to 2 times that of the same wire stretched out straight to the same currents. Hence any formula which makes it less or only greater by a very small percentage must be wrong.

A formula given by Sommerfield gives, as Black has shown, too large a value for R″/R, and another formula given by Cohen has only been tested with rather low-frequency currents.

There seems, therefore, still room for mathematical investigation to obtain for us a formula for the resistance of spiral wires to high-frequency currents, which shall be as much in accord with the results of observations, as are the formulæ given by Lord Kelvin and Dr. Russell for straight conductors. The experimental work for this Paper has been very carefully carried out by Mr. A. D. Peacock, superintended by Mr. G. B. Dyke and by me; and to them I am indebted for the experimental results here given.

* *See* T. P. Black, "Widerstand von Spulen für Schnelle Elekt Swingungen," "Annalen der Physik," Vol. XIX., p. 157, 1906.

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SEAL HUNTING IN THE ARCTIC ICEFIELDS.

An Account of the 1910 Expedition.

BY

ERNEST T. FISK,

Marconi Officer on the SS. "Florizel."

The "Florizel" was the largest of the ships that made the voyage. She was the first to be fitted with Wireless Apparatus, and the only vessel fitted with an equipment in 1909. In the following year the SS. "Eagle" was also fitted. Wireless Signalling proved to be of such valuable service during the voyage, that, previous to setting out on this year's expedition, several more of the vessels of the fleet were equipped with similar sets of Marconi Apparatus.

THE morning of March 12th was fine, clear and calm. At Harvey's coastal wharf lay the three "ventures"—the "Adventure," "Bonaventure" and "Bellaventure" side by side; further up the harbour was the "Florizel," while a short distance astern of her was the "Beothic."

Shortly before the hour of sailing, every available harbour tug was steaming round us with sightseers. The Governor was among them on board a launch belonging to H.M.S. "Calypso."

At four in the afternoon, the five ships cast off and steamed out through "The Narrows" in single file, led by the "Florizel," while the wooden ships which completed the fleet had sailed from Pool's Harbour, 100 miles north of St. John's, at eight o'clock that morning.

A "Whitecoat," Bawling.

At 10.30 p.m. Captain Kean of the "Florizel" received a wireless message from the "Eagle," giving the position of the wooden fleet. They were already in the icefields and found conditions very hard for progress.

That was the first wireless message to be exchanged between two ships of the Newfoundland Sealing Fleet.

At 11.0 p.m. we ran into heavy broken ice which became more closely packed as we proceeded. By two o'clock next morning we were well into the icefields, ploughing our way slowly. In clear water the ship steamed thirteen knots an hour, but here, with the same pressure, she made no more than five knots.

We were then in the vicinity of the Funk Islands, but had lost sight of land.

At noon this day, March 13th, the ship's position was 22 miles north by east from the Funk Islands. During the afternoon we passed numerous "bobbing holes" where seals had been to the surface for breathing, which were good indications of whitecoats being in the vicinity.

Two different types of seal are hunted: they are the Harp Seal and Hood Seal. The young Harps are always referred to as "Whitecoats" because of their white

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The "Florizel" Jammed.

furry coats, and are the most sought after.

Towards evening a strong breeze came up from the W.S.W. with driving snow, and the ice became heavier. The ship was stopped at 7 p.m. for fear of passing a patch of seals and missing them in the night. The "Bellaventure" stopped also about half a mile to the eastward.

A wireless message came from Captain "Joe" of the "Eagle," who was making a western cut, reporting the ice very heavy there and progress very slow. They had seen a few old seals.

We started again the next morning, March 14th, at 4.30 a.m. The ice was very heavy and a great deal of butting was necessary. Many times the ship came to a dead stop with engines working at full speed ahead. At 6.30 p.m. the ship jammed in heavy ice and could move neither ahead nor astern with all her 2,300 horse-power, and was only freed after continuous working for four hours at "Prizing" and "Blasting," which necessitated seven kegs of powder, each keg thirty pounds, being used.

The next day, Tuesday, came in splendidly. The sun shone brightly over a frozen ocean and the sky was a clear blue. The icefields appeared to be absolutely solid, not a break or a lane could be seen anywhere, and there seemed little hope of making headway through it, The "Bellaventure" was alongside, and the two ships commenced working together, ahead and astern all day.

The ice was not so heavy the next day, and we made better progress. We were steaming N.N.E. in line, and continued north until the latitude of Belle Isle was reached, and finding no seals there, turned south-east. At three o'clock in the afternoon, a wireless message came from the "Eagle" saying their men had just returned from a long walk to the westward, where they had seen thousands of old seals cleaning themselves. That was a good sign of young seals being in the vicinity. The news was passed to the "Bellaventure" by megaphone, and both ships steamed in that direction. The "Beothic" and "Bonaventure," which had been following us all day, went away in a different direction. At noon we were ninety miles from the "Eagle," in latitude 51.58 N. and longitude 53·14 W. During the afternoon we passed several scattered families of Hood Seals. The next morning was very foggy, and at eight o'clock, after steaming all night, we were not more than sixteen miles from the "Eagle's" position. Seeing no sign of seals in the vicinity, and that further progress in that direction was useless, our courses were changed to E.S.E.

The fog continued with drizzling rain, making it an impossibility to see more than a few yards from the ship.

At 11 o'clock the "Bellaventure" stopped and a man was seen to jump out on to the ice and capture a fine large whitecoat. This caused some excitement, as whitecoats are seldom found away from the patch. Twenty minutes later they were thick around us. They might have been seen hours ago but for the fog, and we might have missed them had we not steamed right into their midst. They laid around us in thousands and their cries could be heard in all directions.

Before the ship was stopped the Captain shouted, "All hands out!" and immediately 160 men were clambering down the sides and on to the ice. Two or three watches (each watch consisting of 30 or 40 men under the control of a master) commenced killing close by. Other watches went further away to work and were lost to sight a few yards from the ship in the fog.

A westerly gale sprung up in the afternoon and cleared the fog. At 7 p.m. the ship

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was stopped for the night. Whitecoats could be heard bawling on the ice all night, and by moonlight the old seals could be seen roaming around looking for their young.

A message had been sent to the "Eagle," giving the position of the patch, and she steamed toward us all day, though her progress was slow through heavy ice. She stopped about twenty miles from us at 8 p.m. and reported seals around her.

Next day, Friday, March 18th, our men left the ship at daybreak; they had a three-mile walk over the ice to another patch where they made a big kill. The ship was jammed all day, and remained in the same position overnight.

At daylight the men left the ship again and went away in single file over the ice.

The next day was Sunday and no seals were killed.

Another wireless message came from the "Eagle," which indicated that seals were very plentiful in her vicinity.

Killing commenced again at daylight on Monday. Whitecoats were about in thousands.

During the afternoon we steamed through several miles of rugged and rafted ice which made a beautiful sight.

The next morning there were over 600 men in sight killing seals. They constituted the crews of four ships, the "Bonaventure," "Bellaventure," "Beothic" and "Florizel."

From the barrel aloft could be seen smoke from the "Adventure" to the eastward, and just above the sou'west horizon appeared the wireless spars of the "Eagle."

A wireless message came from the "Eagle" reporting that her rudder had been unshipped by rafting ice, but was reshipped after three hours' hard work.

On March 29th (Monday) several of the wooden ships were around us with their men at work on the ice. Lines of men tramping and groups of men killing could be seen in all directions.

Great rejoicings were held on board after the day's work was finished on Tuesday, March 30th. We had on board the pelts of 43,000 seals; all previous records for one ship were thus beaten.

The remainder of our pelts were picked up on Wednesday morning, and the total amounted to 49,000. By 3 o'clock that

The End of a Day's Journey.

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afternoon our work with the seals was practically finished.

When all were safely aboard, with flags flying and men cheering, we headed for St. John's, on April 1st, and made very good headway through the ice homeward bound.

We left the icefields on Friday morning, and forty-nine blasts of the whistle were given as we passed Cape Bonavista to tell them we had 49,000 seals.

Just before 4 o'clock in the afternoon we rounded the North Head and entered St. John's Harbour.

It was a case of "See the Conquering Hero Comes." The news had preceded us, and the shores and wharves were lined with hundreds of people.

The whole fleet had returned by the first week in May, and the total catch amounted to over 300,000.

NEW PATENTS.

A patent, numbered 4910, of 1910, for an improved method of overcoming the effect of atmospherics or X's on receivers has recently been granted to Marconi's Wireless Telegraph Co., Ltd., and Mr. C. S. Franklin.

The opposition method of eliminating objectionable signals is now well known and consists of two receiving circuits, one tuned to the wave length of the signals which it is desired to receive, and the other to a slightly different wave length, the detectors in these two circuits being connected in opposition to the telephones. With this arrangement signals of the right wave length produce a much more powerful effect on one detector than on the other and can therefore be heard in the telephones, while signals of all other wave lengths produce almost equal effects on the two detectors and therefore no sound in the telephones.

In the present invention two tuned detectors are placed in the same circuit and the receiving system is given two natural wave lengths by inductive association with a closed oscillation circuit, thus producing the same effects as if the detectors were in two differently tuned circuits. The advantage of this arrangement is that powerful X's, whatever their wave length, set the receiving circuit oscillating at its natural frequencies and therefore produce little or no effect upon the telephones, while signals which affect one detector more than the other are heard with only a slight diminution of strength.

The Post Office Electrical Engineers' Journal commenting on the recent action brought by Mr. Marconi and his Company against the British Radio-Telegraph and Telephone Company, says: "As is usual in litigation proceedings on patents, the defence attacked the validity of the principal patent at issue, but the fight mainly turned on questions of oscillation transformers and their equivalents, together with questions of strong and weak couplings. Mr. Marconi was given what is practically an unqualified verdict. A decision, so definite in its terms, and conveying so broad an interpretation of the Marconi tuning patent of 1900, necessarily affects the position of the smaller fry of wireless telegraph concerns very seriously, perhaps the more so as they are now between the devil and the deep sea, being bound on the one hand by the judgment given, and on the other by the restrictions as to character of transmitting appliances imposed by the Postmaster-General in conformity with the regulations of the International Radio-Telegraph Convention. The first demands that the broadly interpreted Marconi patent be not infringed, whilst the latter practically insists on a method of syntonic transmission, embracing modern practice in syntonisation of the circuits being used. The whole case was closely argued out, and the written judgment forms an interesting and instructive document which should serve to throw light on the legal view of the wireless telegraph position generally, and form a useful guide for future reference."

The Egyptian State Telegraph Department have placed an order with the Company for the installation of Marconi apparatus on board the yacht "Mahroussa," belonging to H.H. the Khedive. The plant will be a standard 5 K.W. ship set, which will give the yacht a working range, under normal conditions, of about 350 miles over sea. The installation will be completed in about six weeks time.

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MARITIME WIRELESS TELEGRAPHY.

THE Marconi International Marine Communication Company continues to make good progress in the Mercantile Marine, and additions are being made daily to the number of boats which already send and receive wireless messages at sea. The month of April saw the fitting of the Booth Line's Royal Mail Steamers "Denis" and "Hildebrand," which run between Liverpool and Brazil. The "Hildebrand" is the latest addition to the fleet, and left Liverpool, April 19th, on her maiden voyage to North Brazil, calling at intermediate ports in France, Portugal, and Madeira. The Booth Steamship Company, Limited, has long been identified with the rapid progress of the Amazon ports of Para and Manaos.

Of Messrs. Elder, Dempsters Company's express boats, running between Liverpool and West Africa, the SS. "Karina" is the latest to be fitted with the Marconi Company's Standard Plant. This vessel is the second on the African service to be fitted with wireless apparatus, but it is the intention of the owners to have all their express steamers on this route similarly equipped.

The Compania Peruana de Vapores y Dique del Callao Company's SS. "Pachitea," trading on the West Coast of South America, was also fitted.

There are now quite a number of vessels trading to and from the Clyde, which have wireless installations on board, and we may now add the "Tritonia" and the sealing vessel "Seal," which were both equipped during the month of April. The "Tritonia," which belongs to the Donaldson Line, runs between Glasgow and Canada; while the "Seal" is a new vessel built for the sealing trade, and is owned by Messrs. J. A. Farquhar and Co.

The SS. "Athenic" of the Shaw, Saville and Albion Line, with a service between London and New Zealand, *via* the Cape; and the SS. "Andorinha," owned by Messrs. Yeoward Bros., running from Liverpool to Lisbon and the Canary Islands, were similarly equipped during that month, together with the SS. "Volturno" and "Campanello" of the Uranium Steamship Company, having a service between Rotterdam and New York, *via* Halifax.

The SS. "Leicestershire," of the Bibby Line, made her first voyage since being fitted with wireless apparatus on May 4th. She sailed from Liverpool for Egypt, Colombo, Southern India (*via* Tuticorin), and Rangoon. Four other boats in this service, belonging to Messrs. Bibby Brothers, will be fitted on their arrival back in port; while the SS. "Oxfordshire," which is now being built, will also be equipped.

Orders have been received for the equipment of five of the New Zealand Shipping Company's vessels, viz., the "Ruahina," "Ruhapehu," "Rotorua," "Turakina," and the "Remuera."

The SS. "Cæsarea" and "Sarnia," of the London and South Western Railway Company's cross channel boats, are expected to be fitted at the end of the present month. The same Company have also given instructions for the equipment of two more of their Channel boats, now building.

* * * *

La Compagnie Generale Transatlantique of Paris have entered into contracts with La Compagnie Française Maritime et Coloniale de Telegraphie sans Fil, for the installation of Marconi Apparatus on 14 additional vessels of its fleet, which are as follows:—

MEDITERRANEAN BOATS.

"Maréchal Bugeaud," "Eugene Pereire," "Duc de Bragance," and "Ville d'Alger."

ATLANTIC BOATS.

"St. Laurent," "Hudson," "Californie," "Louisiane," "Quebec," "Montreal," "Abdel-Kader," "Virginie," "Mexico," and "Caravelle."

The French Company has also concluded the arrangement for the equipment of the SS. "Medgerda" and "La Marsa," for La Compagnie de Navigation Mixte.

* * * *

The Marconi Wireless Telegraph Company of America recently completed the installation of a wireless set on the S.Y. "Noma," which is owned by Col. Astor.

Mr. Robert W. Todd is having a three-masted schooner yacht built named the "Karina," which will be similarly equipped.

A 2 K.W. 480 Cycle Ship Set has just been supplied to the Canadian Government for the C.G.S. "Kestrel."

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The Marconi Wireless Telegraph Company of Canada, Limited, is extending its business on the great lakes. A station has already been erected at Port Arthur, Ontario (the head of the lakes), and it is hoped before the end of the summer to have a complete chain of inter-communicating stations between Montreal and Port Arthur.

The Company has completed contracts with the Canadian Towing and Wreckage Company, Limited, of Port Arthur, for the equipment of three of their vessels, namely the "Imperial," "Luddington," and "Empire"; and with the Northern Navigation Company for the equipment of their steamers "Harmonic" and "Huronic," the two latter being among the largest and finest boats on the great lakes.

The stations at Heath Point, Anticosti, and Fame Point, Quebec, were reopened on May 1st, the Government Icebreaker "Montcalm" taking men and supplies to the stations from North Sydney. All the stations from Cape Race to Montreal are now in operation.

* * * *

The Reid Newfoundland steamer "Invermore" was recently equipped with the Marconi Apparatus by the Marconi Wireless Telegraph Company of Canada, Limited. This vessel takes the place of the SS. "Bruce," recently wrecked near Louisburg, Cape Breton, on the Canadian Newfoundland service plying between North Sydney, Nova Scotia, and Port aux Basques, Newfoundland.

* * * *

Arrangements have been made with the Italian Ministry of Posts and Telegraphs, whereby ships of the Deutsche Betriebs-Gesellschaft für drahtlose Telegraphie, equipped with Marconi Apparatus, may continue as they have done in the past—to correspond with Italian coast stations at the old tariff; while those ships of the D.E.B.E.G., not fitted with Marconi Apparatus, will be allowed to communicate with Italian coast stations on and after the 1st June, 1911, when a new Convention will come into force.

* * * *

A 2 K.W. set has been installed on board the Norwegian Cruiser "Troll." With the mast facilities on board, a normal working range of about 150 miles will be obtained.

Compulsory Wireless Telegraphy on Board Ship.

In our last issue we referred to the passing of an Act by the Senate and House of Representatives of the United States making the installation of wireless apparatus on ocean-going vessels compulsory. The following is an extract from a notice subsequently issued by the Department of Commerce and Labour:—

The Berlin Convention has been ratified by the following nations and provinces:

The United Kingdom and British South Africa, Germany and all German Protectorates, France, Norway, Japan, the Netherlands, and Dutch Indies, Russia, Sweden, Austria-Hungary, Spain, Denmark, Belgium, Brazil, Turkey, Portugal, Roumania, Mexico, Bulgaria, Persia, and Tunis.

Wireless operators, holding valid certificates, issued by the governments named above, will be recognised as persons "skilled in the use of such apparatus" within the meaning of the Act cited, unless in the case of a specific individual there may be good reason to doubt the operator's skill and reliability. Such certificates should be ready at hand for the inspection of Customs or other officers before the ship departs from the United States.

Methods of assuring the skill of other operators will be the subject of another regulation. Generally speaking, an operator to be "skilled" within the meaning of the Act should be able—

(*a*) To send on an Ordinary Morse Key for five consecutive minutes at not less than twenty words per minute, five letters being counted as one word. The accuracy of signalling, the correct formation of the letters, and the correctness of spacing will be taken into account.

(*b*) To receive and write legibly at the prescribed speed from a double head gear telephone receiver as ordinarily used for radio-telegraphic reception.

(*c*) To understand simple diagrams of the electrical connections of the apparatus.

(*d*) To be able to connect up the apparatus.

(*e*) To name the principal parts of the apparatus and indicate their use.

(*f*) To mention the most common faults, and the means usually taken to remedy them.

(*g*) To explain the steps taken to change from one wave-length to another, in sending and receiving.

(Signed) CHARLES NAGEL,
Secretary.

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Panic Averted by Wireless.

Great excitement was recently caused on the American shore when, in a dense fog, the steamer "Prinzess Irene," with 1,724 passengers on board, struck on a sand bank opposite Lone Heel Life-Saving Station, near Fire Island, about 40 miles east of New York.

Immediate aid was rendered in response to the C.Q.D. call sent out by the Marconi operator on board; but, notwithstanding the continued efforts to relieve her, the "Irene" remained in the same position for two days, during which time wireless messages were frequently exchanged between the passengers and their friends on shore.

Over 10,000 words passed through the Marconi Station at Sagaponack.

* * * *

At the forty-sixth annual meeting of the Liverpool Training Ship "Indefatigable," it was stated that quite a number of boys are becoming efficient in wireless signalling, and several have already gone to sea as assistant operators, and have given every satisfaction.

MARCONI FIELD STATION APPARATUS.

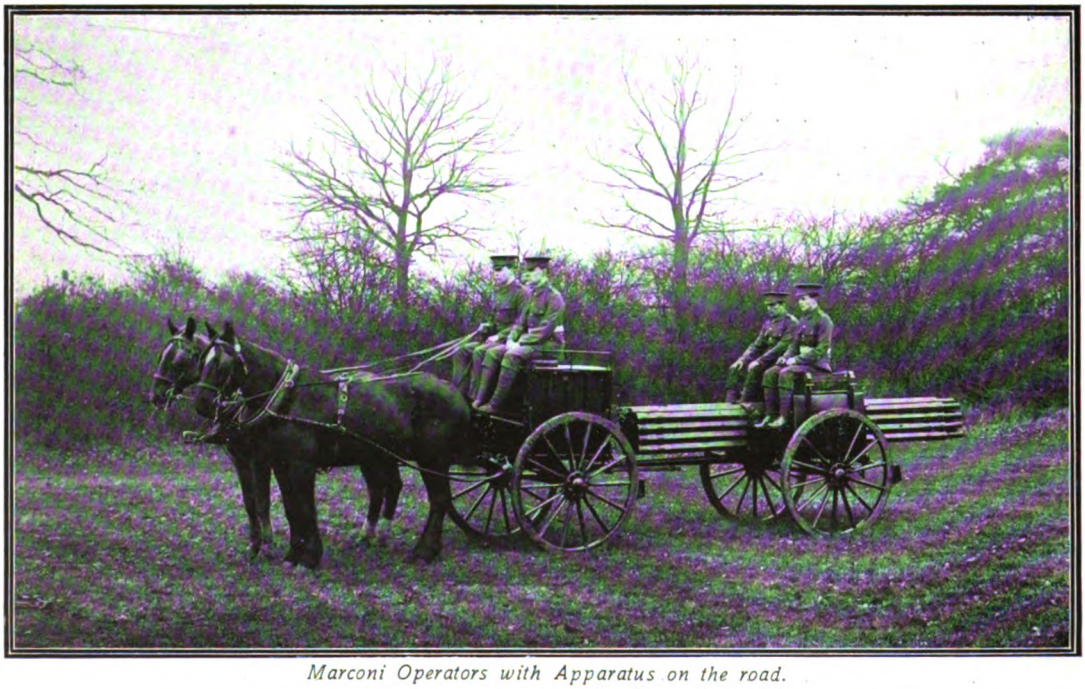
Since the publication of our last issue, in which we referred to the tests of the new 1½ K.W. portable military stations, a further series of trials have taken place between Broomfield (Chelmsford) and Grantham, a distance of 95 miles. The results proved to be eminently satisfactory, and the proceedings were watched by certain members of the War Office. A station was next erected at Selby, Yorks., and communication continued with Broomfield, a distance of about 136 miles.

The test over this increased distance proved to be equally satisfactory.

Finally the Selby station was moved to Northallerton (Yorks.), where thoroughly reliable communication was immediately established with Broomfield, a distance of bouat 200 miles.

Cavalry Sets for India.

The Indian Government recently placed orders for two of the Marconi new type of cavalry set. They are intended to be used by the sappers and miners for field telegraph work.



Marconi Operators with Apparatus on the road.

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THE MARCONIGRAPH

No. 3. June, 1911. Subscription, 3/- per annum, post free. Price 2d. Post Free 3d.

Wireless Telegraphy in India

FOR some years past the Indian Government have been considering the question of erecting a network of Wireless Telegraph Stations in order to link up the principal towns and military garrisons of the vast area under its control.

The first active development of this scheme took place in the beginning of this year when the Marconi Wireless Telegraph Company, Limited, received an important order from the Indian Government for the erection of four stations for the purpose of connecting Simla, Delhi, Allahabad and Calcutta, and we have reason to believe that this preliminary move is only the first step towards connecting up other important cities as well as certain of the military garrisons on the North West Frontier, where wireless telegraphy is likely to play an important part from the strategical point of view, by offering a rapid and reliable means of communication between the long chain of outposts extending from Quetta to Peshawur, and where at present considerable difficulties exist in maintaining any system of land line communication, owing to the extremely mountainous nature of the country and the unruly character of its inhabitants.

A map showing the positions of the Marconi Stations now in course of erection.

The work of erection of the first four stations above mentioned is being actively carried out at the present moment under

(Continued on page 4.)

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BARON DE LA CHEVRELIÈRE.

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Baron de la Chevrelière

President and Managing Director of La Compagnie Française Maritime et Coloniale de Télégraphie sans Fil.

MONSIEUR LE BARON DE LA CHEVRELIERE, whose photograph we reproduce this month, has devoted himself to wireless telegraphy from the very outset of the practical application of this new science. Having immediately understood its brilliant future and promptly recognized the incontestable superiority of M. Marconi's invention, he resolved to interest himself actively with its development.

In the year 1901, he joined the Board of Directors of the (Belgian) Compagnie de Télégraphie sans Fil. Subsequently he recommended the formation of an affiliated Marconi Company in France, and on the 4th June, 1903, the "Compagnie Française Maritime et Coloniale de Télégraphie sans Fil" was founded. M. Marconi himself joined the Board, which was composed of men of high position and influence, including M. Charles Roux, who is, *inter alia*, President of the Comité Central des Armateurs de France; M. Dal Piaz, Directeur-Général de la Compagnie Générale Transatlantique, and M. Musnier, Administrateur de la Compagnie des Messageries Maritimes. M. le Baron de la Chevrelière was elected President and Managing Director of the Company, which offices he still holds, devoting much of his time to the conduct of the Company's business.

To-day all the principal passenger vessels flying the French flag are fitted with the Marconi System, and the shipowners express their satisfaction with the great utility of the wireless service and the efficient manner in which it is conducted.

The Company suffered for some years from the antagonism of the French Government, but recently this disadvantage has been removed. A contract of an important nature has been entered into between the French Government and the Marconi Companies, creating between them a complete understanding, assuring the most cordial relations in the future.

M. le Baron de la Chevrelière was at one time a member of the French Parliament; he is Mayor of his Commune and general counsellor of his Department.

He was formerly an Officer of the Dragoons. Having retired from active service, he is now a Major of the Reserves and an Officer of the State, holding the high distinction of the Military Legion d'Honneur. He is an accomplished sportsman, and a member of the French Jockey Club.

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the supervision of the Company's Engineer, Lieut. R. R. Cooke, R.N. (ret.)

The first station is being erected at Simla, the famous summer resort of the Viceroy, and seat of the Government during the hot weather months. It is situated a few miles south of the River Sutlej, on a spur of the Himalayas, at an elevation of about seven thousand feet above sea level.

The Simla Station consists of a Standard 5 K.W. installation, and will be furnished with two directional type aerials, 1,000 feet in length, and one short receiving aerial of 320 feet in length. The antenna will be supported by three masts of the sectional steel type, the mainmast being 260 feet in height, with two extension masts of 110 feet above ground level. Power will be supplied by a slow speed oil engine, which has been specially selected for work at high altitudes.

The Simla Station will connect direct with the Delhi Station, and from thence to Allahabad, and finally to Calcutta.

The City of Delhi is one of the great industrial, banking and commercial centres of the Indian Empire, and will be specially remembered as the scene of the terrible massacre of Europeans which took place during the great Indian Mutiny of 1857, in which same year it was afterwards stormed and retaken by a very small British and Native Force after a memorable siege.

The Wireless Station at Delhi is to be of a more powerful character than that at Simla, and is being furnished with the Company's Standard 30 K.W. apparatus. The antenna will be of the directional type, consisting of two inverted L-shaped aerials, each 800 ft. in length, together with one receiving aerial for short waves. The whole aerial system is to be supported by six sectional steel masts, 260 ft. in height, whilst the necessary power supply will be obtained from the local mains.

At Allahabad, the capital of the United Provinces of Agra and Oudh, situated at the junction of the Ganges and Jumna, and one of the chief educational centres of the Empire, and finally at Calcutta, the capital of British India and the official seat of the Government, two 30 K.W. Stations are to be erected, one at each place, and similar in all respects to the Delhi installation, with the one exception, however, that in both the latter cases the stations will be self-contained, the power being supplied from a slow-speed horizontal type oil engine.

All the four stations above mentioned will be furnished with their own batteries of accumulators, whilst the receiving apparatus is of the very latest type, comprising the Company's well-known oscillation valve receiver—an instrument which may justly be said to be the *dernier mot* in so far as concerns this type of apparatus.

Slangkop Station.

May 10th saw the opening of the new Marconi Station at Slangkop, Cape Town, which has been erected by the Company to the order of the Union Government of South Africa.

Palm Beach Station transferred to Key West, Florida.

The Marconi Station at Palm Beach was recently transferred to Key West, Florida, where the wave length in use is 1,250 metres. The call letters—M B S—are the same as were used for Palm Beach Station.

Cocos Island Wireless Station.

That great commercial benefits have been derived since the opening of the Wireless station at Cocos Keeling Island was demonstrated when a passenger bound for London on the Orient steamer "Orsova," which had left Fremantle, Australia, on March 14th, sent a message via the Cocos Island Wireless Station to the *Perth Sunday Times*, when the ship was four days or 1,700 miles out from Fremantle.

Movements of Engineers.

Mr. S. Kos is returning to England from the Cape, where he has been in charge of the erection of Slangkop Station.

Mr. Rackstraw is on his way home from Singapore, where he has been in charge of fitting Marconi Apparatus on vessels for the Eastern Extension Telegraph Company, Ltd.

Mr. Rice, who was Engineer in charge of installations at the Turin Exhibition, has now returned to England.

Mr. Rattray, having completed the installation on the Greek warship "Averoff," left Spezia for England on May 30th.

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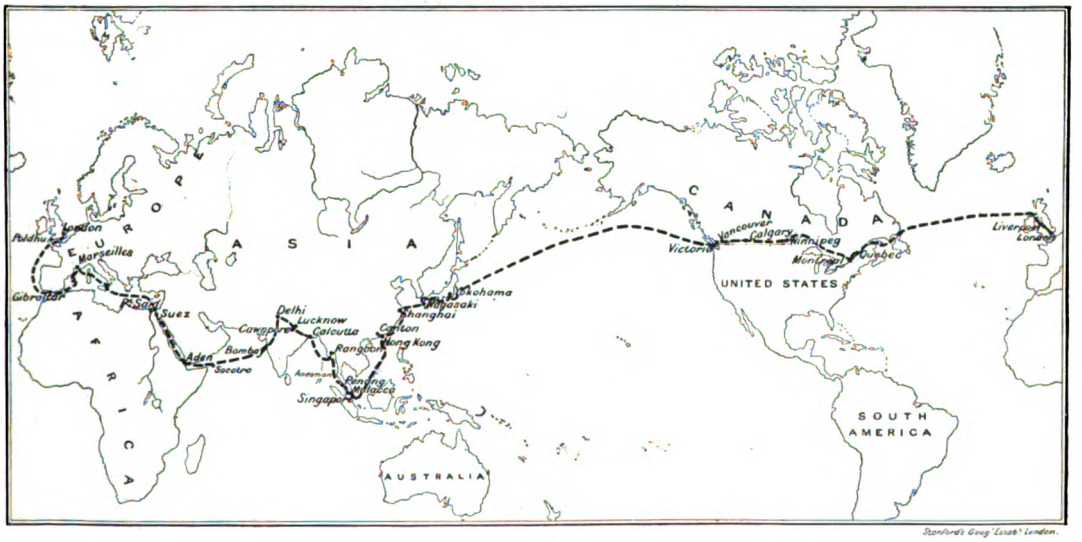
Round the World with "Wireless."

By Edward E. Long.

THE following is the record of a journey made round the world with "wireless," that is, with "wireless" on such portions of the journey as were not undertaken overland. "Wireless," with two slight exceptions, filled in the "blue sea" gaps and made communication possible over the vast stretch of ocean which has to be encountered by him who would encircle the globe—put a girdle round the earth. Nowadays, thanks to "wireless," a girdle *has* been placed round the world: a belt of communication runs from West to East, from East to West, and just what this means to those who for various reasons journey far overseas, can be realised, fully, only by the old *voyageur*. To be steaming on, on into the misty distance, for days, and the while to be in touch with home and friends, with the shore, at any rate; credible as it may seem, now, to those who have not travelled, but who hear and see so much of the results of wireless telegraphy, to the traveller at sea it seems incredible—a perpetual miracle, but, withal, one conferring the greatest boon upon him it is possible to conceive. Who, having travelled much in the ante-"wireless" days, does not remember the air of anxiety attendant upon a voyage, the feeling of uneasiness that prevailed when land was lost sight of, not to be regained for several days; the longing to be in touch with civilization once again, and to know all that had happened in the interval; the rush, too, for papers, brought out by the pilot, and telegrams, the eagerness to learn the leading news items of the world? And in time of rough and stormy weather, what old-time traveller does not remember the profound desire with which he was filled to know what sort of weather lay ahead—how many more hours of *mal-de-mer* he might reasonably expect? In changing all this, wireless telegraphy has affected a complete revolution in travelling by sea, the ocean voyage has been shorn of some of its greatest



This illustration shows the route taken by Mr. Long on his journey round the World.

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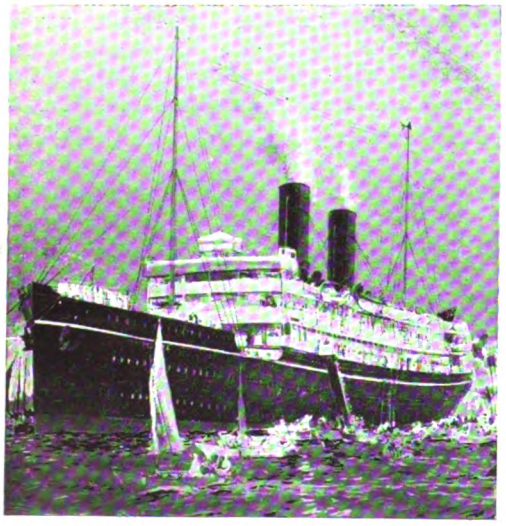
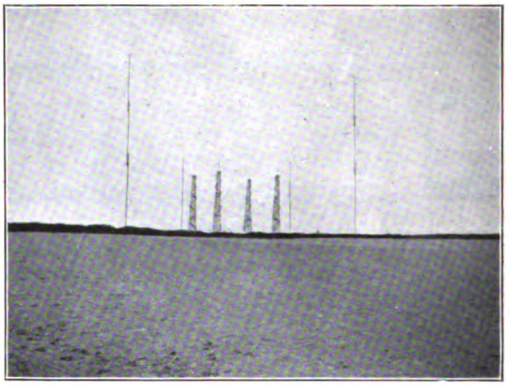
disadvantages, and people are being tempted now "to go down to the sea in ships," who, formerly, could not be persuaded to leave dry land.

The writer went round the world with "wireless" some time back, soon after it became first possible to do so. In the route followed, there were two gaps, but one of these has been filled now, and, by a slight alteration of the route, it is possible to go the whole way round with "wireless." There are, of course, many ways and means of undertaking a journey round the world, but the more general one is to go *via* the Atlantic and Pacific, to Japan, China, India, the Suez Canal, and the Mediterranean to London, or Marseilles; or *vice versa:* the course followed by the writer was from West to East—from London to Bombay, and on. London was left in the Autumn of 1909, and since a good deal of time was spent in Upper India, during the most enjoyable "cold weather" which prevails there from November to February, the journey was not brought to a conclusion until the middle of the following year. The voyage to Bombay was made *via* P. and O.—the vessel, the SS. "Malwa,"



The P. & O. Liner SS. "Malwa."

then one of the three largest steamers of the P. and O. fleet. Magnificently fitted, she was carrying, for, I believe, the first time, a "wireless" installation, thus making her maiden voyage under the auspices of the new telegraphy. The vessel which had



A distant view of the Marconi Station at Poldhu. The "Farewell" Station.

made the previous voyage from London to Bombay, or, at any rate, a voyage just ahead of the "Malwa," the "Morea," had been the first steamer to enter Bombay harbour with "wireless," and great had been the acclamations with which she had been received in Bombay; and when the "Malwa" arrived at the Indian port, "wireless" was still a great novelty.

The writer, being a bit of an old sea-dog, and not fearing a little tossing, made the trip down the Channel, across the Bay, and to "Gib." On the day of departure, an equinoctial gale was blowing, even old Father Thames being heavily white-capped, and the sea in the Channel, once the North Foreland was passed, running mountains high. But of that no matter; the "Malwa" had "wireless" abroad, and all the way down to Plymouth, crashing through the breakers, we could crack jokes with our friends ashore and assure them that we were as fit as fiddles—which some of us were not, decidedly—and Plymouth left behind, the giant Eddystone lost in the sea mist, the "receiver" was busily engaged in "receiving," and the "transmitter" in "transmitting;" and so on into the Bay, past Ushant—dreaded Ushant—and across to Finisterre, with the seas growing higher hourly, and the roll steadily increasing, likewise the spirits of those who do not like

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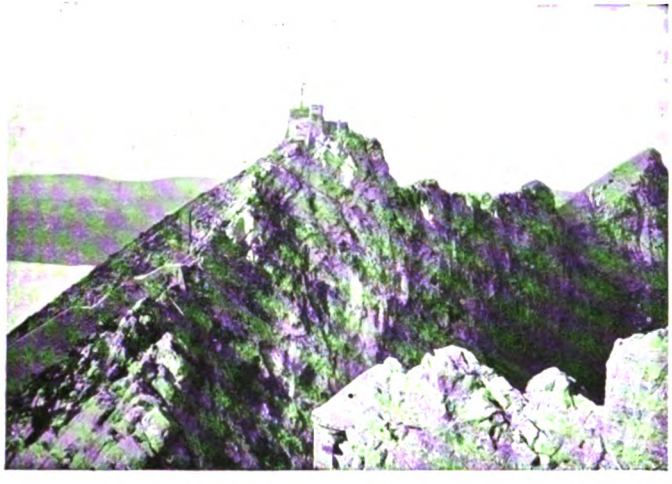
the sea in an angry mood, decreasing, though, by wandering along forward, on the saloon upper deck, the sound of the "wireless" instrument might be heard a tap-tap-tapping out the messages to home, and *terra firma*.

What "wireless," even, could not accomplish with the sorely-distressed, genial sunshine and smoother weather accomplished, as Tarifa, and then the Rock, hove in sight. And now messages began to come in from the war-craft anchored about "Gib," from the Rock itself, and from those mercantile vessels which carried "wireless," as all good vessels should. "What sort of weather had we been having?" was the general question, and a very sensible one, and if the answer we gave them was not satisfactory, at any rate it was useful. Maybe it kept a cruiser or two from starting out to "run through" it, and gave the passenger and cargo craft, homeward bound from the East, a timely warning, enabling them to batten down and prepare for a good wetting. A scamper ashore at "Gib" to stretch one's legs, and for the griffins to see the place, all that one is allowed to see of it; to ride out to the Spanish lines, buy flowers and fruit, drink a glass of good Malaga, and wonder much at the motley crowd which foregathers on Gibraltar and manages to extract a living therefrom; and then away—up past the Balearic Islands, across the Gulf of Lyons to Marseilles, to pick up the people who have had, some no time, others no courage, to come round by sea. A few hours out we meet with a strong head sea, which creates a decided "pitch," and, curiously enough, many of the people who were ill on the other side, who could not stand the rolling, do not seem to mind the pitching; and others, who were not ill with the rolling, go under now. So there are fashions even in sea-sickness; some "prefer" the "roll," others the "pitch," but there is one fashion which, at times, is apt to deal out a knock-down blow to the hardiest sea-traveller—it is the "roll-*cum*-pitch" and "pitch-*cum*-roll" fashion! But pitch or roll as the vessel may, the "wireless" continues to spell out messages; what there is to be known, we get to know, and the sensation created thus is so different from that which we were wont to experience in pre-"wireless"—I was about to say prehistoric—days, that it seems difficult to believe we are racing along through the sea to port; but for the motion, one might be in a train, on land, with the advantage, however, that here one can read as one runs, which is not possible, yet, in the case of railway travelling.



Signal Station, Gibraltar.

At Marseilles a day's stay, or to be correct, an afternoon and a night. A turn in the town, when you get there—from the disagreeable and very extensive docks—Marseilles—Massiglia—with its antiquities, is very interesting—dinner at the famous fish-restaurant, and the theatre afterwards, make a pleasant interlude in the itinerary of the voyage, and prepare one for the distressing experience of a night in harbour, with all its varied nerve-wrecking sounds. At early morn the Continental folk come aboard, and soon we are off to, and through the Straits of Bonifacio, by Corsica and Sardinia to the Italian coast, to pass, later, down the Straits of Messina, between Scylla and Charybdis; on our right, the ill-fated city Messina, slowly recovering from the awful catastrophe which plunged it

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into misery unutterable. Then out into what may be termed the open waters of the Mediterranean, skirting by the mouth

Port of Marseilles.

of the Adriatic, famous for its storms in the time of the Apostles; maintaining for us, now, its hoary reputation, and justifying the saying of the pessimists abroad—that misfortunes never come singly, and who have been looking for the third gale: three is a lucky number! From the gaunt, bare and rocky coast of Crete, to the bluest of blue waters that lie between here and Egypt, and fringe the coast of the land of the Pharaohs, and when several hundred miles out, and several hundred miles from Port Said, to receive a "wireless" message therefrom—a message of enthralling interest to most of us—a message causing grave anxiety to one or two, till a later message sets fears at rest.

At this time, Somaliland had not been abandoned, as regards the interior; we were, in fact, policing a desperately wild tract of country, which lies between known Somaliland and Abyssinia, well in the Somaliland portion, of course. The Somalis had been fairly quiet, but the raiding of convoys, if they managed to get the ghost of a chance, was not entirely unexpected, and the message flashed out to us now through the medium of the electric waves which traverse space told us that there had been heavy raiding, with casualties on the British side. All was excitement aboard, especially in circles military, whilst those who were bound for Egypt wondered whether it would mean troops for the front: every one remarked on the wonder of "wireless." Right up to Port Said we continued to get news by "wireless," and when, after half a day of coaling, spent ashore, we started to steam slowly down the Canal, we kept in close touch with the Gateway to the East. In the Canal there is great scope for "wireless." At present, in order to pass with safety, and to ensure that no damage is done to the Canal banks, one vessel has to "tie up" whilst another goes by, and this "tying up" causes no little bother and delay. The number of times a vessel has to "tie up" depends, of course, on the number of vessels in the Canal, and it is possible to know when "tying up" is necessary only as the vessel necessitating the operation comes into sight ahead. If all vessels carried "wireless," throughout the entire length of the Canal, they would be exchanging messages with each other, and it would be possible to estimate almost the exact time it would occupy to go through the water-way, a thing impossible at present. Being a mail-boat, we were not hampered much, and in good time we made Suez—another "wireless" station, providing us with more news.

Then down into the Red Sea, dreaded of all men—who know it—and well deserving the epithet "red," on account of its temperature, and not on account of its colour.

Port Said.
"The Gateway to the East."

In the Red Sea, as in the Suez Canal and the Mediterranean, "wireless" kept us in touch with all that was going on. The latest in Somaliland, and the latest from the course, came in on each other's heels, and the

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latter news was peculiarly interesting, because a "classic" event had been decided, concerning which there had been an "auction sweepstake" aboard, and with a crowd of passengers numbering well over three hundred, an "auction sweepstake" is no mean affair. At any rate it proved a counter attraction to the heat, and helped to while away the time between Suez and Aden, together with Mocha on the mainland, where the coffee comes from, sometimes, and the little Isle of Perim. An hour or two at Aden—though long before

Aden Signal Station.

we made it we were exchanging messages with a British cruiser lying at anchor there—and then away, across the Indian Ocean. So far as I remember, Aden had no "wireless" station then: it is to be hoped it has one now, for never was such a station more needed, nor likely to be of more use. Aden has become one of the important caravanserai on the great highway of the world: ships of all nations visit it, and in the time of the dangerous south-west monsoon, it is able to give very valuable meteorological information; it can furnish news, also, of Arabia, and it ought to be able to keep in constant communication with the Persian Gulf, on the one hand, and Bombay and Karachi on the other. Aden ought to be a great "wireless" station, and the task of making it such is one of paramount Imperial importance, and of vital interest to India.

The next day or so, whilst passing the lonely Isle of Socotra, the thought occurred that here, also, was a suitable site for a "wireless" station, though, to be sure, one would pity the operators stationed on it. Socotra could maintain communication with Bombay, Aden and Zanzibar, besides affording help to vessels approaching and leaving it. A vessel fitted with "wireless" which happened to have the misfortune to run ashore on the treacherous Somali coast, and was in danger of being looted, would be able to inform Socotra, and through Socotra, Aden, or Aden direct, and call a British war-vessel to her aid. And the station could be utilized in the suppression of the slave-trade; Aden, also, could be useful in this way. Halfway across to Bombay we met the sister ship, the "Morea," exchanged greetings, and ascertained the state of the weather, learning that it was "gloriously fine." To receive news, also, from India—from Bombay, and not to see who had brought it, to be just out there in mid-ocean, not a living thing in sight, and yet to be in touch with the distant shore towards which we were heading, it seemed to be impossible—make-believe; that it was nothing of the kind, however, we knew when a day or so before entering port we found notices posted up advising us that for a certain charge we could send messages to our friends in all parts of India announcing our probable time of arrival, an enormous convenience to them, and, what was of special interest to us for the moment, that we could book rooms at the Taj Mahal—Bombay's palatial hotel. To be able to do all this whilst far out at sea, and to receive messages from friends awaiting one on shore—the value of it all is amazing to those who have travelled much before and never been able to do it. A generation will arise soon which will look upon all this sort of thing as part and parcel of the voyage, as much an item of it, perhaps, as the bill of fare, and the *punkah* in the Red Sea, but to travellers of this generation, it must remain more or less of a novelty, when they think of the old days, a novelty to be appreciated heartily.

At Bombay, the first portion of the journey round the globe came to an end. We all left the "Malwa," most to scatter themselves over India, many to stay till next leave-time, some to return to England at the conclusion of the "cold weather," others to roam further afield. The next few months were spent by the writer in Upper India, Lucknow, Cawnpore, Delhi,

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Agra and Calcutta, and in the jungle, and from Calcutta, early in April, he essayed another portion of the journey by sea—from

Bombay.

India's capital to Burma's capital—Rangoon. This journey is usually made by means of a British India Steam Navigation Company's steamer. At this time, the vessel which carried me across the Bay of Bengal was not fitted with wireless apparatus. It ought to have been—all the British India boat ought to carry "wireless," for surely never did boats need it more. At some seasons of the year, cyclones, of a very disastrous nature, are prevalent in the Bay, and great damage, to shipping and loss of life they occasion. Calcutta has "wireless" communication, and there is a Wireless Station on the Andamans; it has been there for a long time and done yeoman service, and it is in touch with the Burmese coast, also, and valuable work is done with these stations in the way of warning shipping of dangerous weather, but until the steamers using these waters are themselves fitted with "wireless," there must be greater risk attached to the voyage across the Bay of Bengal from Calcutta to Rangoon, from Madras to Rangoon, and from Calcutta and Madras to Penang and Singapore, than there should be. Singularly enough, I came very near to being one of those to suffer by reason of the absence of "wireless." The day previous to sailing, news was received that a cyclone was somewhere about in the Bay; the Andamans had reported it. The "Palitana" was allowed to sail, however, but it was not without some misgivings as to the weather that we steamed down the Hooghly. It was afternoon when we left; at night we were awakened by the sudden cessation of the engines, and then slept but fitfully, wondering whether it was a bad breakdown. In the morning, however, we were informed that we had been stopped by a wireless message, forwarded to us by the pilot brig, by signal, ordering us to refrain from proceeding on our journey, on account of the proximity of the cyclone. Ten or twelve hours were spent, altogether, in cruising about, and then we resumed our voyage—and missed the cyclone, but up the Rangoon river, three days later, we saw another British India boat, which had been through it, and suffered considerable damage. "Wireless" had been the means of our salvation; though we had not carried it.

A few days in Rangoon, the rapidly-growing business centre of Burma, and then on by coasting steamer, through the beautiful Mergui Archipelago, to Penang, there to take train for Malacca, through the Federated Malay States and from Malacca on, by small local steamer to Singapore, a hundred miles or so distant; and the run through the rubber plantations and the tin-mining districts of Malaya was interesting, and instructive. After a short stay in Singapore—pearl of the Orient—on, by P. and O. "Devanha," to Hong Kong. Here, again, I had to travel by a steamer which was non-"wireless," though the "Devanha," which carries the mails from Bombay to Shanghai, has since made good the defect. We left Singapore on the fateful Friday when King Edward lay dying at Buckingham Palace, and few, very few, of his subjects oversea knew that he was dangerously ill. Two days later a passing craft, which had left port a few hours later than ourselves, signalled that the King of England was dead. So startling was this message, and so bald, with no details whatsoever, that the captain of the "Devanha" was almost disinclined to believe it. As we approached Hong Kong, and met craft after craft with flag half-masted, however, we knew that the news was only too true, but what a great deal more we could have learned had we been fitted with "wireless." Strangely, too, Singapore was then, I believe, without a "wireless" station, when it should have been one of the first places to have been equipped

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with a powerful installation, having regard to its importance and unique situation. Like the Bay of Bengal, the China Sea is infested with cyclones, termed "typhoons," at certain seasons of the year, and Hong Kong and Singapore ought to be in constant wireless communication, so as to be able to afford the most reliable information to vessels fitted with "wireless" plying in those waters. Further North, "wireless" does already play a great part in tracking the typhoon, and it should do so throughout the whole region.

At Hong Kong, after a run up the West River to Canton, I joined the Canadian Pacific steamer "Empress of India," and travelled aboard of her to Shanghai, up past Formosa, Japan's go-ahead colony, and thence to Nagasaki, through the Inland Sea of Japan—the superb Inland Sea—to Kobe, and round to Yokohama. The "Empress of India" carried "wireless," and one felt glad to be back with it again. Absence had made the heart grow fonder—of news, and now one was more eager than before, perhaps, to learn what was going on. From cruisers at the mouth of the Woosung we got messages, and between Shanghai—the Paris of China—and Nagasaki, we learned that we had missed the tail-end of a cyclone, the information coming from Japan, for the Japanese are progressive, and believe in according an extensive patronage to "wireless." They use it largely for meteorological, as for other purposes, and they gain considerably by doing so.

Arriving at Kobe, some of us leave the steamer there, and take a three days' scamper through the country to Kyoto, Myanoshita and Fujiama—to rejoin later at Yokohama, and we are all the better for the trip when we steam out of Yokohama harbour, bound for Vancouver, across the dreary waste of water known as the North Pacific Ocean. This journey is about one of the loneliest it is possible to imagine. Practically the only craft taking the extreme northern route across are the Canadian Pacific steamers, and the officers of the steamers say it is a very rare sight indeed ever to meet with another vessel far out from the shore on either side. Here it is, then, that "wireless" is needed, and can play a great part, as it does, thanks to the wisdom and caution of the Canadian Pacific authorities. With the splendid station on the coast of Northern Japan, communication is maintained for over a thousand miles out, then a slight gap, soon forgotten as another C.P.R. vessel comes into the "wireless" radius and tells about the weather we are to get, probably, for the next two or three days, and then, after another brief interval, we pick up the Canadian "wireless" station, and commence to send messages to the Dominion, and to receive them. All across the lonely Pacific, practically, we kept in touch with the world, and the world kept in touch with us. Friends knew that we were safe; we knew that there was a good chance of help reaching us, even in those solitudes, in time of danger. There, it was, that one was led to realise the enormous value of wireless telegraphy—there, where but for it, we should have been deserted and alone for days, shut off from civilization, a company apart from the rest of the world and its busy life.

Sitting at dinner one evening, when we were within a few hundred miles of Vancouver, the man next to me was tapped on the shoulder by one of the stewards and handed a little envelope—a telegram. A telegram—whence? For days we have been at sea; we have yet a couple of days to go in order to reach port. Can this be news from the outside world? We have just passed a "whaler." She has come down from the Arctic Seas, a whale slung alongside, on either side—an unusual and most interesting sight. She has not travelled so far as we have; she was nearer to Vancouver the whole time than we were nine days ago; and yet, whilst probably she has had little or no news for months, we have been receiving news daily—hourly, sometimes. Some day, "wireless" will have reached every "whaler," made lighter the lot of the whalermen, and proved a good investment to the "whaler" owner; meantime, we are led, more than ever, to realise its worth.

Even after Japan—Japan the Magnificent, the Island Switzerland of the East, with its flowers and gardens fair—the approach to Victoria and Vancouver holds one entranced—the dark green pines, the giant snow-capped mountains, the clear, jewel-studded waters. Then comes the adieu to the

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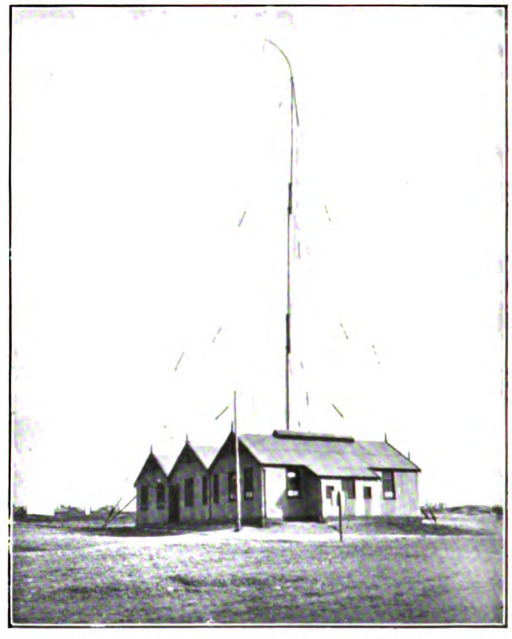
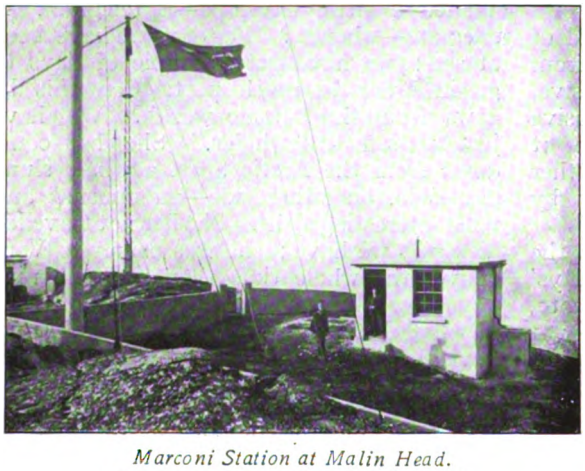
"Empress of India," staunch little craft, and the journey up through the wonderful Selkirks, and the grand Fraser Canyon, to the great Rockies beyond; the descent to rolling, ranching plains by Calgary, and the long ride through the millions of acres of nodding wheat, by vast forests of lumber, rich mineral hills, and the great lakes of the North American Continent, out to Montreal, the St. Lawrence, and Quebec. A rest in the Château Frontenac, up on the Heights of Abraham—lordly pile, overlooking the river beneath and all the surrounding country, and only just below the old Fort for which Wolfe and Montcalm died; and then to the "Empress of Ireland," up the river, to the Straits of Belle Isle—not *belle*, but very misty, cold and dismal, as so often they are—to Liverpool. The "Empress of Ireland" carries "wireless," of course. What steamer on the Atlantic run does not carry it? And now we pass into what may be termed the "wireless" domain. From all sides messages come, thick as leaves in Vallambrosa, till the trouble is to deal with the news



Marconi Station at Seaforth, near Liverpool.
"The End of the Journey."



Marconi Station at Malin Head.
The "Greeting Station" to Ireland.

tomato, is served up, in bulletin form, the news which has arrived overnight — the morning paper. More difficult than ever it becomes to realise that one is at sea; one gets almost at sea, at times, in endeavouring to realise it, but once the Malin Head station is "open," and messages begin to go and come through, there is no time for speculation or imagination: the reality of the arrival home, after a prolonged absence, begins to take the shape of an accomplished fact; the business of arranging about disembarkation occupies the mind. Before I arrived at Liverpool, I had been round the world—with "wireless."

EDWARD E. LONG.

received, not to search for it. Here there is no break in communication. All the way across the "herring-pond" news flies to us apace, and each morning, with the grilled bacon and

[*It must be understood that the journey having been made over a year ago, other Wireless Stations have since been opened on the line of route, and others in various parts of the world are now in the course of erection.*—ED.]

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Enlargement of the Company's Works at Genoa.

Marconi's Wireless Telegraph Company, Limited (Italian Agency), have, in addition to the great number of Italian vessels which have already been equipped with Wireless Apparatus, during 1910 fitted no less than 20 of the large Italian vessels with various power sets.

The apparatus was manufactured at the Company's works at Genoa, and the installations carried out by their staff of engineers.

At the time of the formation of this Agency, large and spacious premises were opened at Genoa, but owing to the rapid development of this branch of the business, and in order to keep pace with the ever-increasing demand for Wireless Apparatus, it has been found necessary to further develop the present works, and for this purpose a concession has been obtained from the Consorzio del Porto di Genova for an additional 423 square metres of land.

Wireless Telegraphy at the Coronation Exhibition, 1911.

No doubt many people are mystified by the technicalities involved in the working of wireless apparatus. Although most of us, if not all, have read about the mysterious way in which messages are flashed through space by the means of wireless telegraphy, the actual working of the apparatus has been witnessed by but a limited few, and for this reason Marconi's Wireless Telegraph Company have had two of their wireless installations placed in the Science Section of the Exhibition, one representing a ship at sea, and the other a coast station.

Two operators are in attendance daily at both these stations and demonstrate periodically how wireless messages are transmitted and received from ship to shore or vice versa. The public will also have an opportunity of sending marconigrams either to ships at sea or to their friends abroad, as the stations act as a bureau for the acceptance of wireless messages.

The present Marconi Works at Genoa.

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High-Frequency Alternators for Wireless Telegraphy

By J. A. Fleming, M.A., D.Sc., F.R.S.,

Professor of Electrical Engineering of University College, London.

NUMEROUS inventors have been attracted by the problem of constructing very high frequency alternators. From 1889 or 1890, when Tesla first constructed an alternator giving a frequency of about 10,000 and fascinated the scientific world with his experiments, others have endeavoured to improve this appliance. The invention of Spark Wireless Telegraphy by Mr. Marconi in 1896, coupled with its simplicity and immediate success, destroyed all interest in these alternating currents of moderately high frequency, but before long the idea that great advantages would ensue if persistent oscillations of very high frequency could be created, again came to the front; and the discovery by Duddell in 1900 of the method of producing by the arc undamped oscillations, caused attention for the next few years to be much directed to this arc method of producing oscillations.

Poulsen's inventions in 1903 were hailed at once as the final solution of the problem and as the "death knell" of the spark method. But these obituary announcements were premature, since practical experience with the arc method revealed at once its defects and limitations. So far from having caused the death of the spark, it has itself fallen into a comatose condition or state of suspended animation: 99·9 per cent. of all the wireless telegraphy in the world is conducted still by spark methods. Nevertheless, the mechanical production of high-frequency oscillations still attracts inventors. Fessenden spent much time and labour in endeavouring to construct forms of Mordey alternators driven by de Leval steam turbines, which could create currents of considerable power and frequencies of 80,000 to 100,000, but he seems hardly to have proceeded beyond the experimental stage.

The latest attempt is that of Dr. Goldschmidt, lecturer in the Darmstadt Technical College, who has devised an ingenious method of multiplying up frequency by means of an induction motor.

If a continuous current is passed through the stator of an induction motor, and if the rotor is caused to revolve by some means, the rotor circuits will be traversed by an alternating current, the frequency of which will depend on the number of poles of the stator and speed of the rotor. If the alternating current produced in the rotor is led through the stator, it will produce a revolving field, which can be used to create in the rotor currents of still higher frequency. These, again, can be led through the stator, and in turn induce higher frequencies still in the rotor. In this manner the frequency can be multiplied up. The currents of intermediate frequency can be taken up in condenser circuits tuned to them, and the final high-frequency current can be made to circulate up and down an antenna or aerial, and so create persistent electromagnetic waves of, say, 10,000 or 20,000 feet in wave length. This process is scientifically and practically possible, and its success, so far as tried, has resulted in a company being formed in Germany to exploit it, called the Hoch-frequenz-Maschinen Aktien Gesellschaft für Drahtlose Telegraphie, with a share capital of £105,000.

Having regard, however, to the enthusiastic manner in which the Poulsen system was hailed by its supporters a few years ago as inaugurating a new régime in wireless telegraphy, it is clear that caution is required before accepting this mechanical method of producing undamped oscillations as a valuable addition to the resources of practical radio-telegraphy. A very fair analysis of its claims to utility has recently been made

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in the pages of a contemporary, but one possible drawback to it was not pointed out, which may prove to be extremely important. The Goldschmidt method essentially depends upon a process of weeding out the intermediate steps in the multiplication of the frequency by means of tuned condenser circuits. Now we know very well the great difficulty in preserving an absolutely constant speed in a dynamo, even when driven by a direct coupled motor. If the speed of the induction motor varies even by a half per cent., this would suffice to throw it out of tune with the various fundamental and harmonic condenser circuits, and so reduce immensely the amplitude of the final high-frequency oscillation. Modern receiving circuits are, however, constructed with such small damping that a ve y small variation in the frequency of the incident waves would decrease the received currents very considerably, and might hence make the signals inaudible. Again, if any pulsation took place in the amplitude of these radiated waves, having a frequency within the limits of audition, it would cause a sound in the receiving telephone which would drown out the sound of the proper signals. Furthermore, in any case, the received wave trains would have to be cut up by a "ticker" to make them audible, and it is more difficult in this way to obtain the high musical note in the telephone required to overtop the sounds of atmospherics than it is when creating uniform rapid trains of intermittent oscillations by the Marconi revolving dischargers, or some form of musical spark dischargers. For all these reasons it will be well to suspend enthusiasm for the new method until it has won its spurs by actual contest with the old-established and reliable spark method in the field of everyday radio-telegraphic work.

New Patents.

Two patents, Nos. 11359 and 11360 of 1910, for improvements in Field Station apparatus, have recently been granted to the Company, and Messrs. R. D. Bangay and C. E. Prince.

The first patent refers to the arrangement of the apparatus in boxes, so that it is divided into loads which can be easily carried by men or attached to the pack-saddles of horses, and so that the fewest possible connections are required between the boxes when they are set up for working. The boxes form of themselves the operating table, and all the apparatus being fixed and connected up inside, there is no packing or unpacking to be done. Further, the primary and secondary of the transmitting jigger are in separate boxes, which only have to be placed one upon the other to make the magnetic coupling between them, the degree of the coupling being varied by sliding one box on the other.

The second patent refers to the attachment of a small generating set to a pack-saddle. The saddle has a rigid metal frame, to the opposite sides of which the petrol engine and dynamo are fixed in their working positions. Thus for working it is only necessary to lift the metal frame (which also forms the bed-plate of the generating set), off the saddle and to couple the engine and dynamo together, with a suitable connecting rod.

Tracked by Wireless.

As in the famous Crippen, case when wireless telegraphy played such a prominent part in tracking criminals on the high seas, a somewhat similar case recently came to light, although in this instance public excitement was not so great. It appears that Mons. D'Abbadie D'Arrast, a well-known Parisian, eloped with a governess, but their plans were frustrated when the steamer arrived at Quebec. A marconigram was despatched from Paris to the SS. "Lake Manitoba," on which the eloping couple had sailed, and consequently they were detained on arrival at Quebec. Mons. D'Arrast, who admitted his identity at once, put an end to a mystery which had been occupying the attention of the Paris police for some considerable time.

In connection with the use of wireless telegraphy in this case, it is a somewhat remarkable coincidence that the pilot Gourdreau who piloted the steamer "Montrose" from Father Point with Crippen on board also brought in the "Lake Manitoba."

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THE MARCONIGRAPH

An Illustrated Magazine for all interested in WIRELESS TELEGRAPHY, published monthly

by

MARCONI'S WIRELESS TELEGRAPH COMPANY, LIMITED, Watergate House, York Buildings, Adelphi, London, W.C.

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The Imperial Conference.

The discussion of the proposal of New Zealand for an Imperial Wireless Telegraph system had not been reached at the time of our going to press, and we are therefore unable to include the report of this subject in our present issue.

Annual Report of La Cie de Telegraphie sans Fil.

The Annual Report and Accounts of our associated Belgian Company (Cie de Telegraphie sans Fil) were presented to the General Meeting of Shareholders at Brussels on the 3rd May.

The Report states that at the 31st December, 1910, the Company had installations on board 88 boats, and during 1910 the Company fitted the following boats:—

4 boats of the Hamburg Amerika Line.
1 boat of the Compagnie Belge Maritime du Congo.
2 boats of the Red Star Line.
2 boats of the Campania Transatlantica Espanola.
1 boat of the Koninklyke Hollandsche Lloyd.
7 boats of the Nederland Steamship Co.
8 boats of the Rotterdamsche Lloyd.
2 boats of the Fred Olsen Line.

Referring to the *Atlantic Daily News* which is published by the Marconi Companies, the report states that at the 31st December, 1910, this journal was published on ten boats of the Compagnie Generale Transatlantique, on 14 boats of the Hamburg Amerika Line, on six boats of the Holland Amerika Lyn, and on three boats of the Koninklyke Hollandsche Lloyd: also that six boats of the Norddeutscher Lloyd and four boats of the Det Forenede Dampskib Selskab were subscribing to the service of long distance press messages.

The Company has declared a dividend at the rate of 10 per cent. on the ordinary shares for the year 1910.

Messrs. Thys and Travailleur were re-elected as Directors of the Company.

Wireless Telegraphy in the House of Commons.

In his annual statement in the House of Commons, Mr. Herbert Samuel, Postmaster-General, made some complimentary remarks concerning wireless telegraphy.

He stated that the number of British ships fitted with wireless telegraphy had more than doubled, the number now being 290; the number of wireless telegrams despatched during the last twelve months had increased by 60 per cent.; a new station was to be erected near Newcastle for the North Sea, and another in the island of Valentia to deal with the increasing traffic in the south-west of Ireland.

Closing Prices, May 31st, 1911.

Marconi's Wireless Telegraph Co., Ltd., London.

Ordinary ... ... 33/9 to 34/9
Preference ... ... 32/6 to 35/-

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Obituary.

We much regret to announce the death of Mr. Neil McIntyre, aged 26 years. He was employed as telegraphist by the International Marine Company of London, from the 5th June, 1905, until 6th January, 1906; by the Compagnie de Telegraphie sans Fil of Brussels from the 7th January, 1906, until 29th October, 1907; and subsequently by the Marconi Wireless Telegraph Company of America. It was at Virginia Beach, where he was employed in the service of the American Company, that he succumbed to an attack of typhoid fever. His aged widowed mother, of whom he was the sole support, is placed in a position full of difficulty and trouble by his untimely death, and without doubt all those of the operating staff who knew "Mac" will be pleased, as a mark of the esteem they had for him, to contribute towards the subscription that is being made on behalf of Mrs. McIntyre.

MR. NEIL McINTYRE.

Subscriptions should be addressed to the Editor of "The Marconigraph" magazine, Watergate House, York Buildings, Adelphi, London, W.C.

The sum of £12 has already been subscribed by La Compagnie de Telegraphie sans Fil, Brussels.

We reproduce a photograph of the late Mr. G. L. Bullock, who was Traffic Manager of the Marconi Companies in London, whose death we announced in our April issue.

MR. G. L. BULLOCK.

This photograph, which we think will interest many of our readers, was taken with a group of the Traffic Department at Dalston a few years ago.

Staff Changes.

Mr. Kearsley, who joined the Company on 15th February, 1909, has left the service of the Marconi International Marine Communication Company, Ltd., having been appointed chief operator of the stations recently erected by the Company in Fiji for the Government.

On his leaving the service of the Company to proceed to Canada, Mr. W. Dixon, for many years on the staff of the Accountant's Department, was the recipient from his friends at the head office of a handsomely fitted suit case.

Athletics.

Marconi Athletic Club (London).

The Cricket Section of the club has, up to the present, enjoyed a very successful season: five matches have been played with the result that three have been won, one lost and one drawn. On the 27th May the Works Athletic Club were met at Chelmsford. The Works batted first but fared badly before the fast bowling of Mr. Ketteridge and were all out for 37; the London team started their innings disastrously, two wickets being down without a run scored but Mr. Menear and Mr. Flood Page, by a good stand, put a different complexion on the game, the London team eventually winning with a score of 60. After the match over 60 of the members of both clubs partook of tea at the Works Clubroom, under the presidency of the Works Manager (Mr. C. Mitchell), after which a billiard, whist and cribbage tournament followed, the London team returning to London by the last train after a very enjoyable outing.

Marconi Athletic and Cycling Club, Chelmsford.

Keen interest is being taken in the Billiard Tournament, in which Mr. Hazleton is scratch man, and many hard games have been played.

The Cycling Section have a good programme of Saturday and Sunday runs from the Clubhouse.

We learn that several members have started training for the Chelmsford inter-works sports gathering, so that last year's record, when nearly thirty-three per cent. of prizes were won by Marconi men, may be beaten.

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Notes on Books.

"ELECTRICAL DISTRIBUTING NETWORKS AND TRANSMISSION LINES, by Alfred Hay, D.Sc. (Cassell, 10s. 6d. net).

There is no doubt that everyone connected directly with the electrical industry will welcome this book. Written by an authority of such high standing as Professor Hay, the work treats of every phase of the subject, both theoretical and practical. A description of the systems of distribution in use, the types of cables, the determination of their sizes and the localization of faults is given.

The book is thoroughly up-to-date, and not only among mains engineers and their assistants will the work reveal much that will help them to grapple with the problems of their intricate work, but to electrical engineers in general the book is not without interest.

"The Electrician" Printing and Publishing Company have several items in their catalogue which appeal to wireless engineers, operators, etc. One of these is Dr. Belcher-Hickman's Wireless Slide Rule; another is Professor J. A. Fleming's "Hertzian Wave Wireless Telegraphy"; and there is the well-known book by Sir Oliver Lodge, "Signalling Across Space Without Wires" (The Work of Hertz and Some of His Successors). The aforementioned publications are in addition to "The Electrician" Primers, which deal with telegraphic and telephonic subjects, including wireless. The Company also publish the "Official International Telegraph Convention and Service Regulations" (Lisbon revision, 1908), the "Proceedings of the Wireless Telegraph Conference, 1903, and the "Proceedings at the International Radio-Telegraphic Conference, Berlin, 1906." These publications are officially accepted by the British Post Office Authorities.

THE PRINCIPLES OF ELECTRIC WAVE TELEGRAPHY AND TELEPHONY, by J. A. Fleming, F.R.S., 906 pp., price 28s. net.

AN ELEMENTARY MANUAL OF RADIO-TELEGRAPHY AND RADIO-TELEPHONY, by J. A. Fleming, F.R.S., 340 pp., price 7s. 6d. (Messrs. Longmans, Green & Co., 39, Paternoster Row, E.C. Second edition.)

These well-known books by Dr. Fleming, F.R.S., Pender Professor of Electrical Engineering in the University of London, have attained a wide circulation. The larger book on the Principles of Electric Wave Telegraphy appeared first in 1906, and ran into a large first edition and second issue. The call for a second edition in 1910 enabled Dr. Fleming not only to revise and re-write the book thoroughly and increase its size by 200 pages, including a new chapter on Wireless Telephony. It has been admitted on all hands to be a classical and standard treatise on the subject of Wireless Telegraphy by electric waves. It appeals to the advanced student, investigator and practical radio-telegraphist, by the thoroughness and extent of its information and treatment, and by its copious references. The work of M. Marconi, as the inventor of radio-telegraphy, is naturally very fully dealt with historically and scientifically, but the scientific work of other inventors also receives full recognition. The mode of discussion comprises a full mathematical analysis of the phenomena of electric wave creation and propagation and application in radio-telegraphy. The smaller manual by the same author is adapted for the use of operators and students whose scientific and mathematical knowledge is more limited, but its exposition of the subject is lucid and careful, and it forms an excellent introduction to the larger book, which for a long time will remain the standard treatise in the English language on electric wave or wireless telegraphy.

Readers of *THE MARCONIGRAPH* are naturally interested in all matters relating to Telegraphy and Telephony, whether Submarine (or Subaqueous), Land or Wave, and they will therefore appreciate

THE ELECTRICIAN, A Weekly Journal, Price 6d., wherein appears everything of interest on these subjects.

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THE PRACTICAL WIRELESS SLIDE RULE.

By Dr. H. R. BELCHER HICKMAN.

An indispensable companion to all who have calculations to make in connection with Wireless Telegraphy, Telephony and allied subjects. The fullest directions are provided for using the rule.

"THE ELECTRICIAN" PRINTING & PUBLISHING Co., Ltd., 1, 2 & 3, SALISBURY COURT, FLEET ST., LONDON, ENGLAND.

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Lectures, etc.

ROYAL INSTITUTION OF GREAT BRITAIN, ALBEMARLE STREET, PICCADILLY, W.

Friday evening, June 2nd.—Commendatore G. Marconi, LL.D., D.Sc., M.R.I., *Radio-Telegraphy.*

Thursday, June 8th.—T. Thorne Baker, *Practical Progress in Wireless Telegraphy.*

Chronicle of Past Wireless Events in the month of June.

3rd June, 1898.—First prepaid Marconigram sent by Lord Kelvin, *via* The Needles and Bournemouth Wireless Stations.

4th June, 1904.—Daily service of wireless news messages inaugurated on the Cunard R.M.S. "Campania."

10th June, 1909.—"Slavonia" stranded on Flores Islands, Azores. Wireless communication effected with the "Batavier" and "Prinzessin Irene," and passengers transferred and brought safely to port.

Visit to the Works.

During the first week in May a party of nearly fifty students from the Institute of Mechanical Engineers visited the Company's Works at Chelmsford, and were shown round the various departments by Mr. C. Mitchell, the Manager, Mr. H. M. Dowsett, Chief of the Testing Department, and Mr. A. Eddington, Assistant Works Manager. The visitors, who were specially interested in the long distance apparatus, expressed themselves as having been quite mystified by some of the technicalities. Tea was served in the new extension at the invitation of the Directors.

Social.

We notice that the Hon. Mrs. Marconi assisted the wife of the Italian Ambassador and Mrs. Angiolo Ortelli to receive some 650 guests at a ball held recently in aid of the Italian Hospital.

The function was a very brilliant one, and amongst the guests were many distinguished persons, including the Italian Ambassador, the Italian Consul-General and his wife, and many members of the diplomatic circle. Signor Caruso was present during the evening.

Field Station Apparatus.

Demonstrations at Constantinople.

Marconi's Wireless Telegraph Company have, during the past few weeks, under the auspices of Major J. E. Cochrane, D.S.O., been carrying out important demonstrations at Constantinople.

Two of the latest Cavalry Type Field Station Sets were used, these being so designed that they may be carried either on the backs of mules, or other pack animals, or alternatively, the apparatus can be carried in carts; the latter type of installation being known as the "Infantry Type" Field Station.

The preliminary trials between these two stations were carried out across the Bosporous, the Infantry set being set up in the precincts of the Naval Barracks, on the north side of the Bosporous, and the pack set (or Cavalry set) being erected at the Selimieh Barracks. After these preliminary tests the Infantry set was sent by rail to Guebzeh, where it was erected in the vicinity of the railway station, the Cavalry set being situated in the vicinity of the Selimieh Barracks; the distance between these two places amounted to some 45 kilometres, the intervening ground being undulating and cultivated.

Messages in Turkish, as well as in European languages, were interchanged, the quality of the signals being thoroughly reliable.

The demonstrations were witnessed by H.H. the Sultan, as well as a large number of Naval and Military Officers.

The trials were still proceeding at the time of going to press.

Wireless for Airships.

It is understood that the Admiralty have appointed Lieut. R. M. Groves, 1st Lieut. of H.M.S. "King Edward VII." to take control of the experiments which are to be carried out with a view to adapting Wireless Telegraphy to the new naval airships. It is expected that he will shortly enter upon his new duties on the "Vernon," the Naval Torpedo School at Portsmouth, where special experiments are now being carried out.

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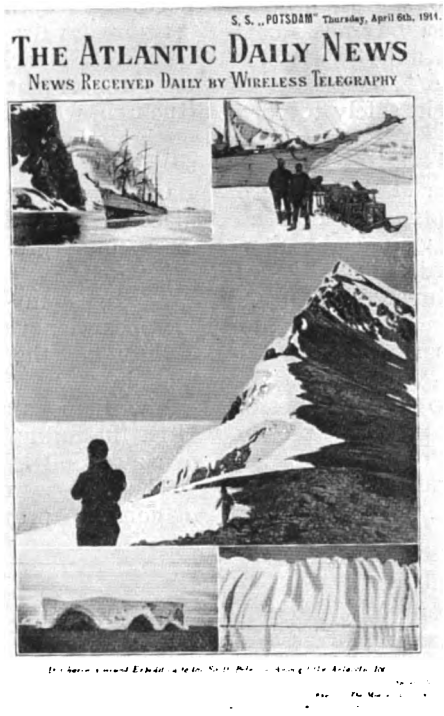
The Transmission of News by Wireless Telegraphy to Vessels at Sea for incorporation in "The Atlantic Daily News."

SOME day, perhaps, when the complete romance of Marconi's Wireless Telegraphy comes to be written, proper provision will be made for an adequate expression of appreciation of the effort that culminated in the production of the *Atlantic Daily News* and its sister papers, *Das Atlantische Tageblatt*, the *Journal de l'Atlantique*, and the *Diario del Atlantico*.

This four-titled magazine, which is admirably printed and illustrated, has become an established necessity in the life on shipboard, for not only is it a recognised advertising medium for the finest products of the world's marts and the best class of hotels, and health resorts, a reliable guide to pleasant travel, a source of news to those exiled on the ocean's watery wastes, and, withal, a literary production of some merit; but, by its very presence on board ship, it affords food for reflection and conversation in those hours at sea which otherwise would be filled with thoughts and remarks on the "day's run," the everlasting topic of the weather, shuffle-board records and the engine-room.


S. S. "POTSDAM" Thursday, April 6th, 1911.

THE ATLANTIC DAILY NEWS

NEWS RECEIVED DAILY BY WIRELESS TELEGRAPHY

A reduced facsimile of a cover of "The Atlantic Daily News."

We reproduce in this number a reduced facsimile of a recent cover of the *Atlantic Daily News* and one of its news pages. The cover illustration varies with each number issued, and it usually is an index of the leading article that the number contains. The news page is nevertheless—notwithstanding our childish liking for pictures — *the* page of interest to those "that go down to the sea in ships." By its means the temporary inhabitants of the modern floating palaces are saved the indignity of ignorance of the world's affairs when they set foot on *terra firma* after a voyage across the ocean, and although it may be asserted that the good old days when ignorance during a crossing was perfect bliss are to be regretted, we venture to express the belief that the assimilation of the concentrated news as now published in the *Atlantic Daily News* and its sister papers is much more beneficial than the study of newspaper back-numbers with which one was faced after an ocean voyage, before the latest "boon and blessing" entered the ranks of journalistic forces.

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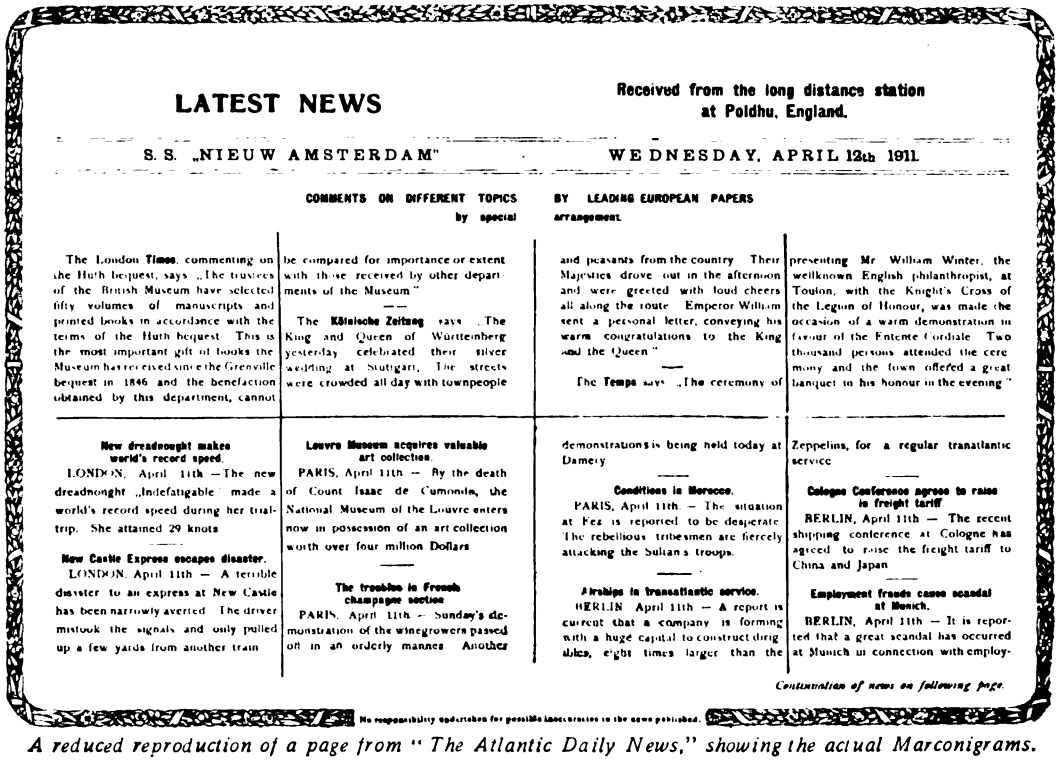
Having once read the paper in some sunny corner of the boat-deck in Summer, or some cushioned snuggery of the smoking-room in Winter, we, as intelligent people, give some thought to the manner in which the news reaches us across the wide. It does not take us long to decide that the choice of news is made in a broad-minded and altogether competent manner, that there is great accuracy in the transmission of the news by " wireless," that the printing staff must have been up betimes to let us have our paper so early with the news presented neatly, and that we are quite fortunate mortals to live in an age of such enterprise ; but what most of us cannot quite grasp is the manner of reception on board. It has all been explained to some points on the earth's surface, the high power stations of Poldhu (Cornwall), and Cape Cod (Massachusetts), having received their respective bulletins of news of eastern and western hemisphere interests, give a few preliminary coughs and clearings of their mighty throats, command the close attention of the many pairs of ears that are anxiously listening for them, and then thunder out their message with Gabrielian voice. At least, it is like that at the land stations. Far out in the ocean the weary-eyed operator, longing for the news and yet wishing it were over, so that he could get away to his bunk, listens with bated breath, watching meanwhile furtively his timepiece to make sure that there is no error in his adjustment, and he heaves a



LATEST NEWS

Received from the long distance station at Poldhu, England.

S. S. „NIEUW AMSTERDAM" — WEDNESDAY, APRIL 12th 1911.

COMMENTS ON DIFFERENT TOPICS BY LEADING EUROPEAN PAPERS by special arrangement.

The London **Times**, commenting on the Huth bequest, says „The trustees of the British Museum have selected fifty volumes of manuscripts and printed books in accordance with the terms of the Huth bequest. This is the most important gift of books the Museum has received since the Grenville bequest in 1846 and the benefaction obtained by this department, cannot be compared for importance or extent with those received by other departments of the Museum."

The **Kölnische Zeitung** says „The King and Queen of Württemberg yesterday celebrated their silver wedding at Stuttgart. The streets were crowded all day with townpeople and peasants from the country. Their Majesties drove out in the afternoon and were greeted with loud cheers all along the route. Emperor William sent a personal letter, conveying his warm congratulations to the King and the Queen."

The **Temps** says „The ceremony of presenting Mr William Winter, the wellknown English philanthropist, at Toulon, with the Knight's Cross of the Legion of Honour, was made the occasion of a warm demonstration in favour of the Entente Cordiale. Two thousand persons attended the ceremony and the town offered a great banquet in his honour in the evening."

New dreadnought makes world's record speed.

LONDON, April 11th — The new dreadnought „Indefatigable" made a world's record speed during her trial-trip. She attained 29 knots.

New Castle Express escapes disaster.

LONDON, April 11th — A terrible disaster to an express at New Castle has been narrowly averted. The driver mistook the signals and only pulled up a few yards from another train.

Louvre Museum acquires valuable art collection.

PARIS, April 11th — By the death of Count Isaac de Cumondo, the National Museum of the Louvre enters now in possession of an art collection worth over four million Dollars.

The trouble in French champagne section

PARIS, April 11th — Sunday's demonstration of the winegrowers passed off in an orderly manner. Another demonstration is being held today at Dameiy.

Conditions in Morocco.

PARIS, April 11th — The situation at Fez is reported to be desperate. The rebellious tribesmen are fiercely attacking the Sultan's troops.

Airships in transatlantic service.

BERLIN, April 11th — A report is current that a company is forming with a huge capital to construct dirigibles, eight times larger than the Zeppelins, for a regular tranatlantic service.

Cologne Conference agrees to raise in freight tariff

BERLIN, April 11th — The recent shipping conference at Cologne has agreed to raise the freight tariff to China and Japan.

Employment frauds cause scandal at Munich.

BERLIN, April 11th — It is reported that a great scandal has occurred at Munich in connection with employ-

Continuation of news on following page.

No responsibility undertaken for possible inaccuracies in the news published.

A reduced reproduction of a page from " The Atlantic Daily News," showing the actual Marconigrams.

of us in beautiful technical language, which, like some strange melody, still echoes in our ears, but which for the life of us we could not reproduce. This, however—deprived of the terminology that usually accompanies the description—seems to be the fashion of its performance. Towards the witching hour, in two widely separated sigh of relief when the mutterings of the distant station reach him softened to a very whisper, beside which oftentimes the tick of a watch is loud in comparison. Manfully he struggles with his desire for sleep, and with the atmospheric disturbances that, drowning the whisperings, would deprive us of our news. With a twist of

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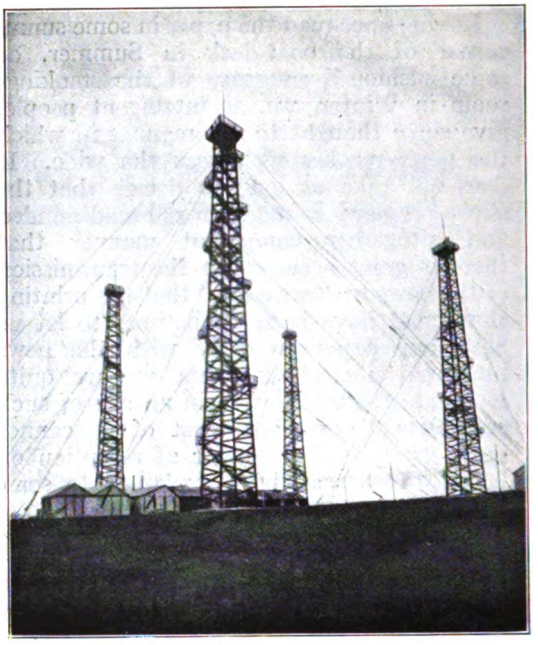
this and a turn of that, with the addition of this wire and the removal of that other, he worms from the air the information that to-morrow is to help us pass many an otherwise weary hour. With mutters of surprise at the news he himself learns for the first time, and with many imprecations on the head of the unlucky steward who seeks to serve him with coffee while he is struggling to resolve the meaning of the signs that cross space with a speed that is affected by no manner of weather, he finally receives the closing signal and the "good-night" of the power station within his range of hearing, glad to know that his paper of the morrow is provided for, proud in the knowledge that he of all the souls on board is the only connecting link with the land that speaks to them of safety and all they hold dear.

It is an interesting subject, this reception of news by long-distance apparatus on board ship, and those passengers of the Cunard Line, the Allan Line, the Aberdeen Direct Line, the Canadian Pacific Railway, the Hamburg-American Line, the Holland-America Line, the Forenede Dampskib-Sellskab, the Koninklijke Hollandsche-Lloyd, etc., are to be envied the simple pleasure that the Shipping Companies and the Marconi Companies thus afford them.



Marconi Station, Poldhu.

In conclusion we would say that the other illustration which we reproduce shows the exterior of the transmitting station at Poldhu.

QUIZ.

The Life of a Wireless Operator at Sea.

By J. R. Stapleton.

Mr. J. R. Stapleton, one of the first Wireless Operators to join the service of the Marconi Company.

WHEN asked to write about "The Life of an Operator at Sea" the task did not appear to be very difficult, but now the prospective has become an actuality the difficulties of portraying generalities within so small a space are distinctly obvious, especially when viewed from the different standpoints that are ever present in a seafaring life, as each view taken presents its own particular aspect, and reveals a distinct picture to each individual observer.

Looking, then, at an Operator's life from the public point of view, the first and foremost thing that strikes one can be summed up in the word "Kaleidoscopic," for it is that in the extreme, and undoubtedly the most prominent feature in the life is that of change—change so complete and swift that we, as the movable parts in the great Kaleidoscope, never have an opportunity

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of becoming stagnant by remaining in the one position, and much of our time is occupied in transition. An Operator may be here to-day and there to-morrow; the "here" may mean the Albert or Millwall Docks, while the "there" may be a ship bound for the Icefields of the North, while to be told to sail for the Sunny South within the next twenty-four hours' notice is not an improbability; it is therefore most essential that an Operator should be *semper paratus*. Once, when packing my portmanteau, a friend made the remark that should my ghost by any chance ever be seen, it would most certainly appear packing a bag; so you see that a most important part of an Operator's changeful life is one of preparation and readiness for any emergency.

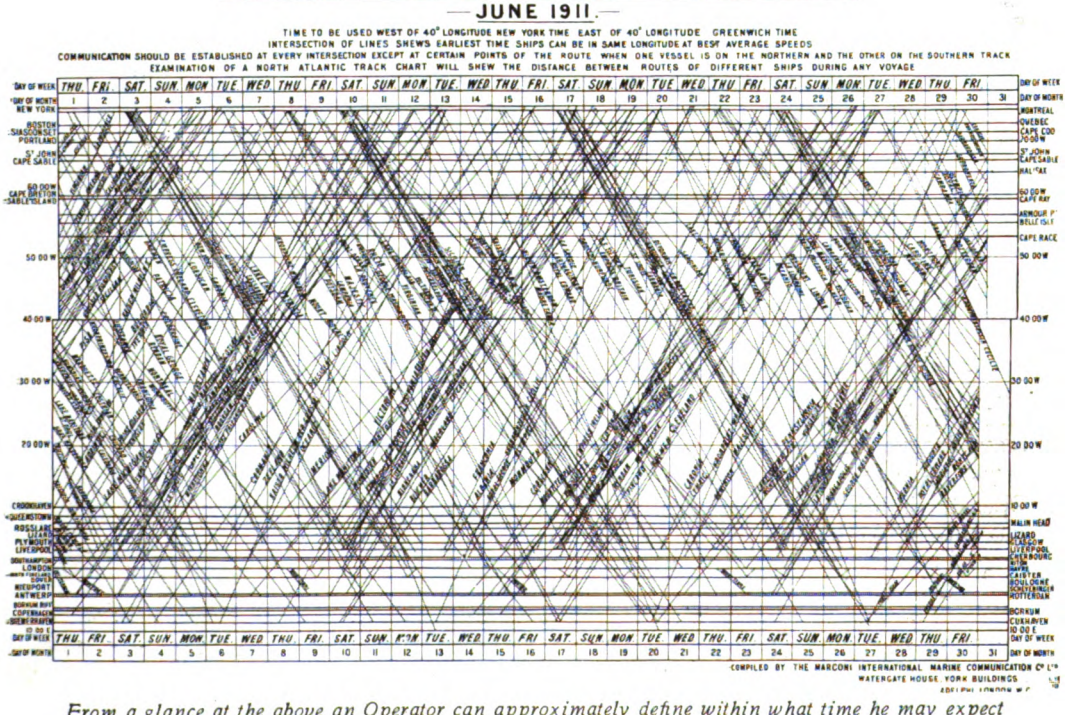
When the trials of "mustering," "signing on," and "baggage" are over, and the ship casts her stern lines adrift, the Operator at once becomes to a great number of passengers a centre of mysterious attraction, for now that home and friends are fast sinking away astern, what is more natural than for them to turn to the individual who holds the key which under his manipulation flashes forth their wishes and desires, for his wireless apparatus is the one connecting link between ship and shore?

An Operator's work brings him directly into contact with the captain, officers, and passengers. He has no regular hours in which to take his rest, and his food is very often left untouched, owing to one's assistant (there are two operators on all the large Atlantic vessels), having "turned in" when meals are served. He is often worried, too, at the critical moments by Quartermasters at the door, with notes from the Captain, Stewards with messages from the Purser, telephone from the Enquiry Office ringing for particulars, and half a dozen passengers waiting to hand in their Marconigrams.

On the whole, the work of a Wireless Operator is most interesting and fascinating, and a layman can hardly appreciate the

COMMUNICATION CHART.

—JUNE 1911.—



From a glance at the above an Operator can approximately define within what time he may expect communication with the various vessels.

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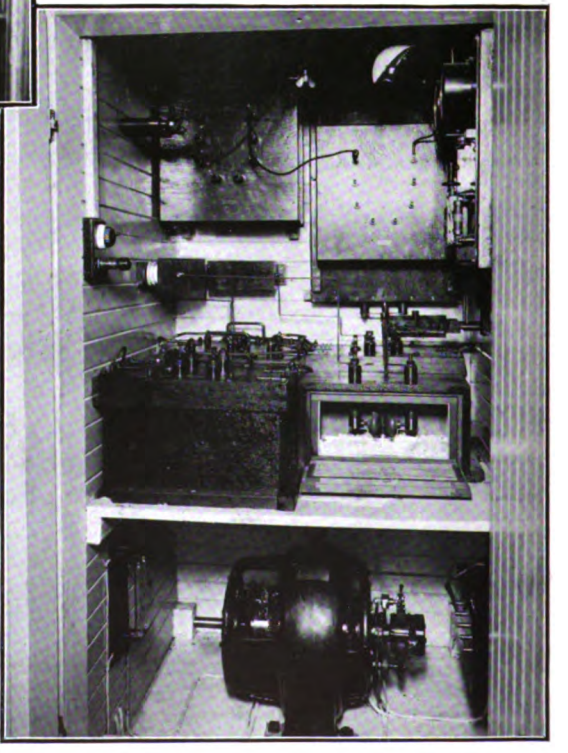
A Marconi Officer receiving messages in the "Wireless" Cabin on board ship.

pleasure of sitting alone in a small cabin in the dead of night, while "throbbing" a lonely way across a desolate sea, and having under one's hand an invisible cord that links up the world and gives the latest news from lands which sank astern days ago, and from ships and other lands which are yet many leagues ahead.

To give an idea of what an Operator is likely to experience, he must imagine himself on a clear starlight night walking the upper decks of an Atlantic Liner, say, outward bound for New York.

"Five Bells" have struck, passengers have all "turned in," the deck lights are out, and the greyhound is ploughing a silent way across the ocean. He enters the Wireless Cabin to relieve the Operator on duty, who has possibly just cleared the "Campania" of her traffic and given good-bye to the "Minnehaha"; whilst the "Kaiser Wilhelm der Grosse" is just coming within range, and the "Cymric," reported 540 miles ahead, bound westward. With a "good-night" the door slams, and he turns to look at his Communication Chart to ascertain what communications he is likely to establish during the night, and learns that, say, the "Kaiser der Grosse" is due in half an hour, the "Lusitania" at midnight, and "Philadelphia," "Amerike," "Rydam," "President Lincoln," "Montrose,"



The Transmitting Apparatus in a Silence Cabin.

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and "Columbia," due to communicate between two and eight o'clock. Before he has finished taking note of the Chart, the Quartermaster knocks and hands in the following note from the bridge: "At 10 p.m., G M T, we were 410 miles S.E. of Sable Island," which means towards dawn he will be in communication with the Wireless Station on that Island.

He then arranges his different switches, winds up the clock-work of the Wireless Receiver, and places upon his head the Telephone Receivers. At once he is connected with the outside world, for now a slight buzzing tells him that the "Minnehaha" to whom his assistant gave "good-night" is fast dropping astern; now he hears faintly the German boat speaking to the Cunard SS. "Lusitania," whilst here is another ship signalling to Cape Race, that she is 200 miles East of Cape Race, and reports two large icebergs and a quantity of pack ice, giving latitude and longitude for warning; an Allan Liner homeward bound with the Canadian Mails signals to Halifax: "10.40 p.m., "Virginian" 150 miles South-East of Sable, all well." Five minutes later he receives the following

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which tells him that the Commercial Cable Company's steamer "Mackay Bennett" is calling and desirous of sending a message. A turn of the hand starts his transmitting gear, and he flashes back

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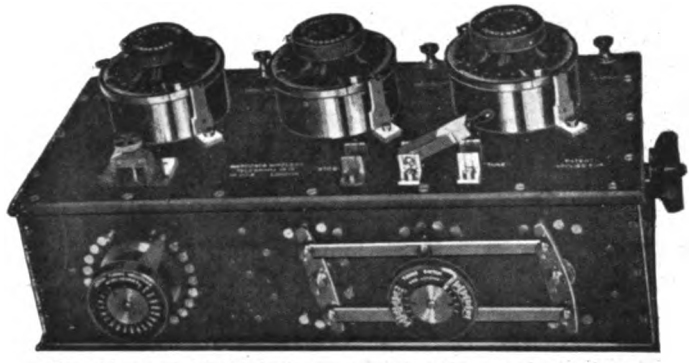
telling her to "Go," and in less time than it takes to describe he has received a messsage for the Commander. The message is acknowledged, and back comes —— ——· ——· ——· ——· which means being interpreted "Good-night, no more." A quarter of an hour's wait and our Operator hears the approaching "Kaiser" calling, and in half an hour has cleared her of her telegrams, and possibly sent her some that he had on hand from passengers aboard



The Marconi Multiple Tuner for adjusting to the various Wave Lengths.

to be sent to friends homeward bound on the "Der Grosse." A glance at the clock shows nearly midnight, and exactly at that hour he must "Stand by" to receive the latest press news from the high power stations situated at Poldhu, in Cornwall, England, and Cape Cod, in Massachusetts, America. He then gives a general call, and tells all stations and ships in the vicinity that he will be "By" in ten minutes for press.

The high power stations work on a special wave length, and our Operator must "tune" his apparatus up to receive that wave, which done, he sits with pencil and paper before him waiting for the first signals from Cornwall, now 2,000 miles astern. Exactly on the stroke of twelve o'clock (G. M. T.) his straining ears catch the following preamble of Poldhu's message: "CQ CQ CQ. Ten private messages after press for "Lusitania," seven for "Campania," three for "Amerika," and two for "Olympic." 486 words of press. . . .' Poldhu then sends a full-stop and commences transmitting its news, which contains the latest telegrams received from all parts of the world up to date. The press is copied out by our Operator and handed to the Purser, who sends it to the printer who reproduces it in the *Atlantic Daily Bulletin*, which can be obtained as a "morning paper" each day during the voyage. Does the man in the street realize that it is possible to have news aboard in the ship's little morning paper as quickly

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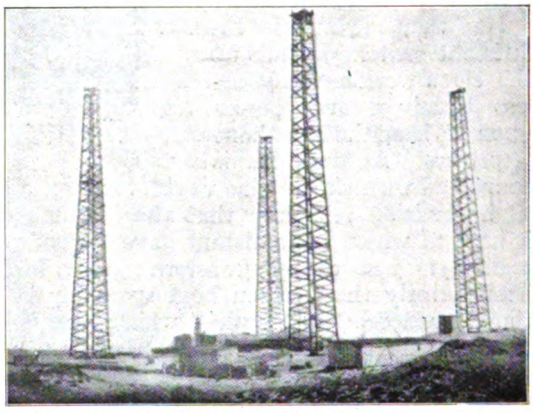
as on shore, and that passengers read the news on the same day as those at home? The following personal experience will illustrate my meaning:

No doubt many readers will recall a terrible collision that occurred one Saturday during 1909, between a Liner and a Cruiser, while going down the Solent in a blizzard. I was then outward bound on the RMS. "Oceanic," which left Southampton on the Wednesday previous to the collision, and we were then about 1,200 miles Westward of the Isle of Wight. As usual, I "Stood by" at midnight that Saturday to receive Poldhu's press, and by 12.30 the whole of the account of the disaster had been received by me, and in less than ten hours after its occurrence it was known aboard every ship fitted with long-distance apparatus within a radius of 1,500 miles of the Long Distance Station. The death of our late King (which occurred at 11.45 p.m.), was known at sea two hours after the sad news was announced in London. I merely mention these incidents to show how wireless has made possible an up-to-date paper aboard ships at sea, and in both these cases I venture to say that those afloat received the news before thousands of people ashore had read it in the daily papers. The following instance shows how an individual aboard may be communicated with in record time, and it will, I think, come as a surprise to many that such a feat is possible. One night, whilst crossing to America on the Cunard ship "Caronia," I was just taking the news from Poldhu, Cornwall, when the operator suddenly stopped, and after a few moments' pause said, "One private message for 'Caronia' in a minute." After the lapse of about five minutes (during which time Poldhu was receiving the message from London), the telegram came through, and ten minutes later the message was copied out and delivered to the passenger, who read it exactly fifty minutes after the sender had handed it into the Central Telegraph Office in London, 800 miles away. This compares well with the usual forty minutes taken by a telegram from a city office to a suburban home. This is a very frequent occurrence, and commercial travellers and business men realize that Wireless Telegraphy remains no longer a mysterious uncertainty, but has become a real and necessary business accessory. But here I find myself wandering into personal experiences, so must hie back to our Operator.

At 2.30 a.m. Poldhu has finished the programme, and our man is glad to have half an hour's rest before commencing to take 500 more words of news from Cape Cod Station, which commences to send out the "latest" American Continental telegrams



Marconi High-Power Station, Cape Cod, U.S.A.

at three. By five o'clock he has finished with Cape Cod, and is glad when the last of the "printer's proof" has been sent down for insertion about 5.30.

The apparatus has now to be readjusted for communication with the batch of ships that should now be well within the vicinity, and having "cleared" them, Sable Island Land Station is on the alert to take messages. This station is so situated that ships remain in communication for sometimes as long as thirty-six hours, many telegrams being sent to both England and America, and replies received to them before the ship is "out of range." By this time, communication has been made with all ships charted, and "cleared" to the land station; our Operator has done a good night's work, is glad to hear the bugle sound for breakfast, and to "hand over" once more to his assistant who comes to relieve him.

Apart from the actual working there are many interesting points in common with the "wireless" which may be studied, and

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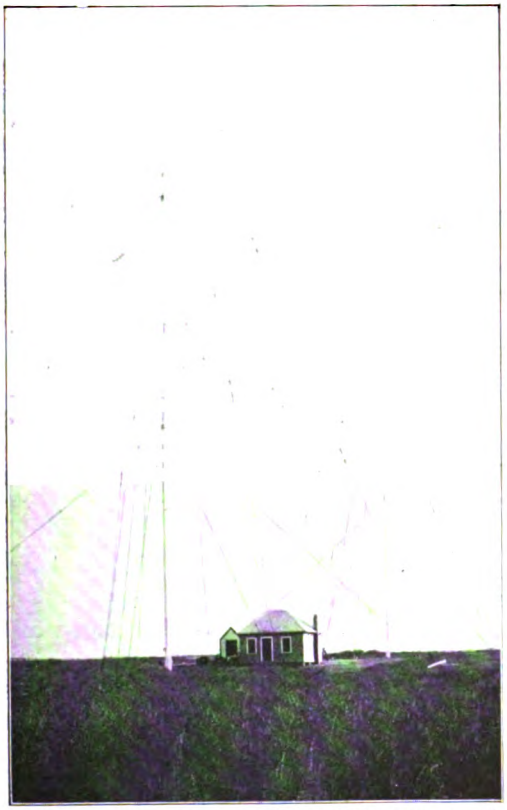
during the hours of "Standing by" the studious Operator may find food for observation. He may, for instance, listen to the discharges, which are conveyed and registered on the receiving telephones (caused by electrical disturbances in the air). It may sound strange to the man in the street to talk of "hearing" lightning, but though this is not actually the case, the Operator can hear in his telephones the disturbances caused by it, as he can also hear the "atmospherics" originating from the Northern Lights and Meteorites. At one time the periodical crashes in the telephones of these "atmospherics" used to hamper the working of wireless, but owing to the discoveries of "tuning," the use of high-frequency sparks and the system of "balancing," the difficulties have been practically abolished. An approaching hailstorm is always preceded by an electrical disturbance, and I have often recorded them and warned the officer on the bridge of the storm's approach long before it has appeared on the horizon.



"Siasconsett," one of the Marconi Stations on the American coast for communication with ships at sea.

Another great source of interest is the unexpected appearance of what is technically called "Atmospherical Phenomena," which means that by a curious combination of atmospheric conditions it is possible to send a message thousands of miles with the same power and installation that under ordinary circumstances would have a maximum radius of 500 miles. While travelling to Africa on the Union Castle steamer "Briton," I transmitted messages right across the Continent to the Wireless Station situated on the Bluff at Durban, a distance over land of 800 miles.

It is a curious fact that the greatest phenomena seem to occur below the Equator, and more especially in and around the South American Continent. The Postmaster-General of Argentine stated a short time ago, that the air conditions in Argentine were so favourable for wireless working that schemes were being formulated for the opening up of many land stations throughout the country. These "Wireless Ghosts" come and go, intensifying the mystery by their very revelations, and like spectres of the night, having no fixed time give, us no clue on which to work out their mythical movements. I feel sure I have said enough already to show that the work is pleasant and peculiarly fascinating by reason of the infinite possibilities it opens out, in the way of the further and greater wonders that remain to be discovered and harnessed for our comfort and convenience. In conclusion I may say that the countries I have visited during my connection with the Company as an Operator are as follows: United States, Canada, Norway, Sewden, Holland, Denmark, Russia, France, Italy, Egypt, Austria, Palestine, India, Arabia, Ceylon, the Maldive Islands, and Africa.

Wireless on Aeroplanes.

Mr. J. A. D. McCurdy, the well-known Canadian aviator, while flying at a height of about 3,000 feet over Long Island Sound, set up communication with a wireless station at New York.

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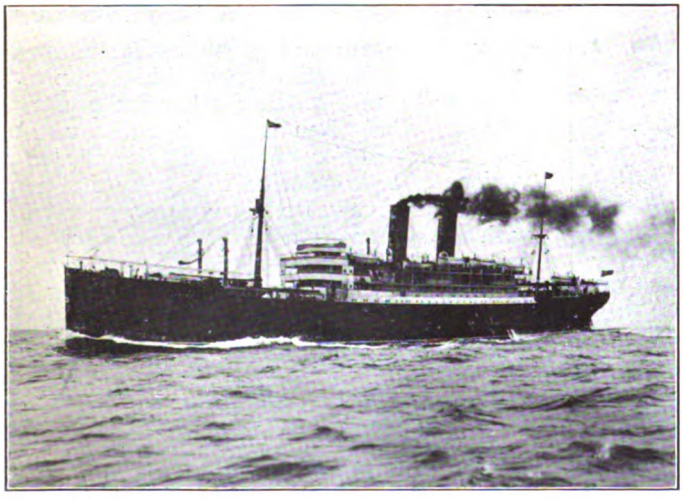
Maritime Wireless Telegraphy.

THE greatest event during the month of May was the equipment of the largest modern liner afloat, the SS. "Olympic," which was launched on May 31st by Messrs. Harland and Wolff at their Belfast yard.

Naturally this vessel, by reason of its remarkable size, should be equipped with a high-power plant, and it is expected that communication at a very long range will be effected.

For the trip from Belfast to Liverpool, thence to Southampton, this vessel was only fitted with a standard 1½ K.W. Ship Set, but a 5 K.W. plant is now being installed and will be completed before she sails on her maiden voyage on June 14th from Southampton to New York.

Although similar power plants have been installed on other big liners now afloat, the greater range which it is anticipated will be attained by the "Olympic" will be due to the greater span between the masts as compared with that of other liners.



Cunard Liner SS. "Ascania."

The new Cunard SS. "Ascania," which marks a new era in the service between England and Canada, was fitted during the month of May, and her initial voyage from Newcastle to Southampton was conspicuous owing to her communicating by wireless with the Kaiser's Yacht "Hohenzollern."

The message was :—"Commander Irvine, R.N.R., of Cunard Royal Mail Steamer 'Ascania,' now on maiden voyage, begs to convey from himself, officers, also directors, general manager and chief officers Cunard Company now on board, their most respectful salutations," to which was received the following reply :—"Many thanks to you and officers of 'Ascania,' as well as to directors and management of Cunard Company for kind message, and every success to new ship. William I.R."

Besides the "Ascania" the following vessels were also fitted with the standard 1½ K.W. Sets :—

The Elder Dempster liner "Falaba," which left Liverpool early in May for West African Ports. This is the third of this Company's steamers to be fitted with Marconi apparatus, although several others are to be equipped shortly. The SS. "Pachitea" of the Peruvian Steamship Company, which sails to various ports on the Peruvian coast, was fitted at Rouen ; the Bibby Line steamer "Leicestershire," which sails between Liverpool and Rangoon, *via* Marseilles ; and the SS. "Corinthic," of the Shaw Saville Albion Line, with a service. between London and New Zealand, *via* the Cape. Messrs. C. T. Bowring and Co.'s SS. "Stephano" was similarly equipped.

The S.Y. "Viking," controlled by the

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Polytechnic Touring Association, which sails from England to Norwegian Ports, has been equipped with a 5 K.W. plant. A similar set is being installed on the SS. "San Guglielmo," belonging to Messrs. Pierce Brothers, and it is expected that this vessel will shortly leave the builders' yard at Glasgow and sail to Italy, from whence she is to take up her regular sailings.

Orders have been received to equip the following vessels, and we shall deal with them more fully in our next issue:—

Northern Navigation Co. (Canada).	SS. "Hamonic."
,, ,, ,,	SS. "Huronic."
,, ,, ,,	SS. "Sarconic."
Leyland Line	SS. "Colonian."
,, ,,	SS. "Californian."
,, ,,	SS. "Antillian."
,, ,,	SS. "Asian."
Peruvian SS. Co.	SS. "Ucayali."
Booth SS. Co.	SS. "Aidan."
Elder Dempster & Co.	SS. "Akabo."
,, ,, ,,	SS. "Burutu."
,, ,, ,,	SS. "Nigeria."
,, ,, ,,	SS. "Tarquah."
,, ,, ,,	One other (name unknown).
,, ,, ,,	Two Express Steamers building.
Turnbull, Martin & Co.	New Steamship building.

Le Compagnie de Telegraphie sans Fil have recently equipped with the Standard 1½ K.W. Apparatus, the following six ships of the Sociedad Pinillos Izquierdo y Compania:—"Cadiz," "Balmes," "Martin Saenz," "Catalina," "Valbanera," "Pio IX," which have a service between Spain and Central African Ports. The same Company have also equipped Empreza Nacional de Navigacao a Vapor "Africa" and "Beira," which sail from Lisbon to South Africa; and the "Monte Video," of the Compania Transatlantica Espanola, which sails from Barcelona to New York and Habana.

Le Compagnie de Telegraphie sans Fil have received instructions for the equipment of the following vessels:—One for the Empreza Nacional de Navigacao a Vapor; Sociedad Pinillos Izquierdo y Compania, SS. "Miguel M. Pinnillos"; Compania Transatlantica Espanola, SS. "Montserrat"; Compania Transatlantica Espanola, SS's "Buenos Aires," "Legazpi"; National Steam Navigation Company of Greece, SS. "Macedonia."

The wireless apparatus (De Forest) installed on the H.A.P.A.G. SS. "Oceana" is being removed for a Marconi set to be installed. The Belgian Company will carry out the work.

The Bureau International de L'Union Telegraphique, Berne.

The following are extracts from the Official Notifications which have been issued by the Bureau International de L'Union Telegraphique, Berne:—

FRANCE.

Monsieur Andre Frouin, Inspector-General, has been appointed by the Government Director of Telegraphs in the place of Monsieur Bordelongue, who, having resigned his position for reasons of health, has been appointed Honorary Director.

Monsieur Bordelongue, who had occupied his position for more than twelve years, took part in the Preliminary Conference on Wireless Telegraphy at Berlin in 1903, as well as in the International Radio-telegraphic Conference at Berlin in 1906. At the latter Conference he acted as President of the Commission charged to examine the draft service regulations.

Monsieur Ch. Chaumet has been appointed, by the President of the Republic, Under-Secretary of State of Posts and Telegraphs.

BRAZIL.

This Administration will exercise the option afforded by par. 5 of Art. xxxvi. with regard to the accounting arising from the exchange of radio-telegraphic service between its coast stations and ship stations. In addition to the radio-telegraphic charge, there will be a uniform surtax of 25 centimes per word without minimum for the land service. No surtax, however, will be charged for delivery to addresses in the following towns on messages sent through the neighbouring coast stations, namely: for Pernambuco if transmitted *via* Fernando de Noronha or Olinda; for Bahia if *via*

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Amaralina; for Rio if *via* Babylonia; for Santos if *via* Monte Serrat. This latter station will be opened shortly. The rates for radio-telegrams sent to the republics of the Plate, and routed on the South American Land Lines, are as follows: Fc. 1.40 per word from a coast station north of Rio, and Fc. 0.90 from a station south of Rio de Janeiro, that town included. The rates for the town of Buenos Ayres are reduced by 20 centimes. The rates for Chili are uniformly Fc. 2.05 for Valparaiso and Santiago, and Fc. 2.15 for the other offices.

FRANCE.

From the 1st April, 1911, stations on French warships will be open to general public service. The ship rate is 5 centimes per word without minimum.

MOROCCO.

Pending the official admission of this Government to the International Radio-Telegraphic Convention, the coast stations at Casablanca, Mogador, and Tangiers, will accept telegrams emanating from vessels at sea carrying installations worked by the Marconi or Telefunken Companies, or by the various shipping companies. These radio-telegrams will be sent, according to their destination, to one of the three cables terminating at Tangiers; and the Marconi Company, the British General Post Office, the Administration of the Dutch Posts and Telegraphs, and the Eastern Telegraph Company, having proposed to send radio-telegrams destined to ships at sea, such radio-telegrams will be accepted by the Moroccan Administration. The rate for telegrams through these coast stations is Fc. 0.50 per word without minimum, comprising coast and landline taxes over the whole Moroccan System until the telegram reaches the cable.

MONTENEGRO.

The following are particulars, as supplied by the Montenegrin Administration, of the wireless station at Antivari-Volouitza:—

Geographical position:	36° 44′ 00″ E. 42° 54′ 00″ N.
Call letters:	M A N
Normal range:	200 kilometres.
System:	Marconi.
Receiving apparatus:	Sound.
Wave length:	About 500 metres.
Service:	Public; also with ships.
Hours of service:	8 a.m. to 12 noon. 2 p.m. to 12 midnight.
Rate:	Fc. 0.15 per word for telegrams to Italy. On telegrams from Italy, Fc. 1 per telegram plus 9 centimes per word.

RUSSIA.

The working of the coast station at Petropavlovsk in Kamtchatka is interrupted, the station having been destroyed by fire.

ITALY.

The Italian coast and ship rate, which is at present Fc. 0.63 per word, with a minimum of Fc. 6.30 per telegram, will from 1st June, 1911, be reduced to:—

(*a*) Coast rate: Fc. 0.30 per word without minimum.

(*b*) Ship rate: Fc. 0.40 per word without minimum.

As regards telegrams exchanged between Italian coast and ship stations, the ship rate will no longer be included in the coast tax.

The above modifications do not apply to Italian Somaliland.

Empire Day.

On Empire Day the following wireless message, despatched in the Indian Ocean by the transport carrying the Australian Coronation Contingent, was received at Buckingham Palace:—

"Officers and men of the Australian Coronation contingent, at sea *en route* for England, send an Empire Day assurance of loyalty and devotion to His Majesty's throne and person, and wish for him a long and prosperous reign as the beloved sovereign of the great British empire."

A reply was despatched by marconigram, thanking Major Wynne, who is in charge of the contingent.

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Movements of Telegraphists.

Mr. H. J. Tattersall has just returned from St. John's, Newfoundland, where he fitted four of Messrs. Harvey & Company's Sealing Vessels, afterwards accompanying the steamship "Adventure" on her expedition in the icefields.

Mr. E. T. Fiske is now in Australia, and is not expected back for some time. He is at present engaged in the fitting of vessels, and has already completed the installation on the steamship "Grantea" of the Adelaide Steamship Company.

Messrs. H. J. Tattersall, A. L. Caldwell, R. Cox, and A. E. Baker, are at present on duty at the Great White City Exhibition, where the Company are displaying a Standard Ship Installation.

Dave Sarnoff, formerly of Seagate, and who has just returned from the icefields, has been placed in charge of the New York Wanamaker Station.

Mr. A. H. Ginman, for many years in charge of the Siasconset Station, is now engaged in the construction department, New York.

Mr. H. S. Williams has been transferred from Siasconset Station to the SS. "Philadelphia."

Wireless Operators in the Navy.

Wireless telegraphy promises to solve, to a great extent, the difficulty of finding employment for Post Office telegraph messengers who have passed the age limit.

It is impossible for all of them to be appointed to the permanent staff of the Post Office, but owing to the rapidly increasing use of wireless telegraphy in the Navy, there is a large demand for wireless operators in the Naval service, and the Admiralty has decided to give special facilities to postal employees in filling the vacancies.

Chess Match at Sea.

Another instance in which Wireless Telegraphy has enabled passengers of two liners on the high seas to participate in a game of chess was recorded, when the chief officer of the Cunard Liner "Ultonia" won a game with the third officer of the Austrian SS. "Laura." During the whole of the play neither vessel sighted the other.

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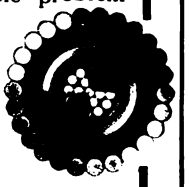

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THE MARCONIGRAPH

No. 4. July, 1911. Subscription, 3/- per annum, post free. Price 2d. Post Free 3d.

Wireless Telegraphy in the Field.

A SERIES of trials have recently been carried out before the Spanish Military Authorities with two Marconi Standard Cavalry Sets in the vicinity of Madrid. The trials which commenced about the middle of June consisted of a series of tests, the majority of which were conducted over mountainous country. On the first day communication was established by means of the two cavalry sets between Villalba and Madrid, a distance of 50 kilometres. On the second day the Madrid set was moved to Otero, and established communication over a range of mountains with Villalba, the distance between these two places amounting to some 35 kilometres. On the following day, the station at Otero was moved to La Granja, and communication was again established with Villalba, the intervening mountains in this case being considerably higher than on the previous day.

It is interesting to note that recently when similar trials were made with other portable apparatus, and between the same places, the results were not nearly so satisfactory, notwithstanding the fact that the masts employed then were more than double the height of those employed with Marconi cavalry sets. On the last day of the trials, June 17th, communication was finally established between Madrid and the Alpine Club, a large number of Royal Engineer Officers being present to inspect the stations, and we are very pleased to note from advices recently received from our Associated Company in Madrid that as a result of the trials the Spanish Military Officers had expressed themselves in terms of the greatest satisfaction as regards the design and construction of Marconi apparatus.

Although the ranges obtained in the above-mentioned tests are not considerable, it must be remembered that communication was carried on throughout over extremely mountainous country, and in view of this we think that the Company, and those responsible for the design and operation of the apparatus, have every reason to congratulate themselves on the eminently satisfactory results.

In continuation of the article which appeared in last month's *Marconigraph* regarding Turkish trials, we regret that no detailed reports are yet to hand regarding the trials which were then in progress. From telegraphic advices, however, we are pleased to state that the trials have now been concluded, and we have every reason to believe that they are regarded by the Turkish Authorities as a complete success.

As regards the portability of the stations, and the time required for erection, it is interesting to note that during the competition before the Turkish Military Authorities, the Marconi stations were erected in 20 minutes, whilst the installations of our competitors required respectively 55 minutes and 2 hours and 10 minutes. We hope in a later issue to give fuller details as to the final result of these tests.

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DR. JOHN A. FLEMING.

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Dr. John A. Fleming

Scientific Adviser to Marconi's Wireless Telegraph Company.

THE subject of our sketch this month, Dr. John Ambrose Fleming, has been connected with the Marconi's Wireless Telegraph Company, as scientific adviser, since 1899. He was born at Lancaster in 1849, and received his scientific training at University College, London, the Royal School of Mines, and St. John's College, Cambridge. At the Royal School of Mines he was assistant to the eminent chemist, Sir Edward Frankland, and at Cambridge was a student and worked under Professor James Clerk Maxwell, whose profound theories of electricity paved the way for the subsequent work of Hertz, and therefore for wireless telegraphy by electric waves. At Cambridge Dr. Fleming gained numerous distinctions, being made successively Exhibitioner in Physical Science, and then Foundation Scholar, Wright and Hughes Prizeman, and finally elected a Fellow of St. John's College. He came to London in 1882 to take a position as scientific adviser of the Edison Electric Light Company, subsequently remaining for nearly fifteen years in the same position with the Edison and Swan, Electric Light Company, Limited, and also acting as adviser to many other companies and corporations. For nearly twenty-five years he has been Professor of Electrical Engineering in University College, London, and during that time has contributed about seventy or eighty scientific papers to various learned societies, describing researches in Electricity, Magnetism, and General Physics. He is the author of numerous well-known text books, amongst which may be mentioned particularly his books on Wireless Telegraphy, *viz.*, his large book, "The Principles of Electric Wave Telegraphy and Telephony," and an elementary manual of "Radio-telegraphy and Radio-telephony." He has given many courses of lectures at the Royal Society of Arts and at the Royal Institution on Wireless Telegraphy and kindred subjects, and has taken out several patents for inventions connected with radio-telegraphy, such as his agmometer and oscillation valve or glow lamp wave detector. In 1892 Dr. Fleming was made a Fellow of the Royal Society, and in 1910 was awarded the Hughes Gold Medal by the Royal Society for his scientific work. In presenting the medal to Dr. Fleming, the President of the Royal Society, Sir Archibald Geikie, K.C.B., said:—

> "For thirty years he has been actively engaged in researches in Experimental Physics, chiefly in the technical applications of electricity. He was an early investigator of the properties of the glow lamp, and elucidated the unilateral conductivity presented in the partial vacuum between glowing carbon and adjacent metal, a phenomenon which has been linked up recently with the important subject of the specific discharges of electrons by different materials. He has published in the Scientific and Technical Press and in technical text-books many admirable experimental investigations and valuable expositions in the applications of electricity, as, for example, to electric transformers and wireless telegraphy. Of special interest and value for theory were the important results concerning the alterations in the physical properties of matter, such as the remarkable increase in the electric conductivity of metals when subjected to very low temperatures, which flowed from his early collaboration with Sir James Dewar in investigating this domain. In recent years he has taken a prominent part in the scientific development of telegraphy by electric waves."

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The Imperial Aspect of Wireless Telegraphy.

AMONG the many possibilities suggested by the Imperial Conference, which was held in London during the greater part of June, perhaps none is more striking than the unanimity with which the delegates acclaimed the practicability of wireless telegraphy. The subject was discussed on the motion of Sir Joseph Ward, the Prime Minister of New Zealand, who declared that the great importance of wireless telegraphy for social, commercial, and defensive purposes rendered it desirable that a scheme of wireless telegraphy approved at the Conference held at Melbourne in December, 1909, be extended as far as practicable throughout the Empire, so as to enable the Empire to be to a great extent independent of submarine cables. Sir Joseph pointed out that wireless telegraphy had advanced so considerably during the last five years that it offered a great inducement to have a world-wide Empire system established. In New Zealand they were having two high-power stations erected, by means of which their system would be guaranteed to carry 1,250 miles during the day and much further at night. In addition they would have four low-power stations, and all the ships in New Zealand waters would be equipped with the wireless system. It would be a splendid thing to have a girdle of wireless stations round the Empire, particularly in time of war, when the existing cables might be cut. Such a system might also be an advantage from the commercial point of view.

The Attitude of the Post Office.

Mr. Herbert Samuel, the Postmaster-General, said that the Home Government considered it very desirable that a chain of wireless stations should be speedily established throughout the Empire, partly for strategic and partly for commercial reasons. It was not thought advisable at the outset to establish the system in every direction simultaneously. Therefore the Government proposed that a beginning should be made with a chain of six stations, one each in England, Cyprus, Aden, Bombay, the Straits Settlements, and Western Australia, and from there it would be linked on to New Zealand. Later on South Africa would be connected *via* either East Africa or West Africa, or by both routes. The working of the system would be by the Post Office and the local administrations in India and the various Dominions. It was suggested that the United Kingdom should bear the cost of the stations in England, Cyprus, and Aden; that India should bear the cost of the station at Bombay; that New Zealand and Australia should bear the cost of the stations in their respective territories; and that the cost of the station at Singapore, that station being created almost exclusively as a link in the chain, should be equitably divided. With regard to the connection of the present proposals with the Melbourne Conference scheme, Mr. Samuel said he was advised that the cost of crossing the Pacific by a chain of stations would be very heavy, while the strategic value would be small and the commercial value negligible. Such a system could hardly be the beginning of an Imperial chain of wireless stations, and he suggested that it would be better to omit the reference to the Melbourne Conference and pass a resolution in general terms in favour of a system of Imperial wireless telegraphy.

Sir Joseph Ward consented to modify his motion in accordance with Mr. Samuel's suggestion, but Mr. Pearce expressed the hope that the Pacific would not be lost sight of. Other European countries possessed colonies in the Pacific, and it was possible that they would not throw away their opportunities in this matter. Moreover, a Western Australian station was being established, and now was the time

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for the matter to be considered if there was any question of adapting their system to any new scheme. Mr. Harcourt replied that the question of the Pacific would not be lost sight of by the Colonial Office in the development of the system.

Sir D. de Villiers Graaff, in supporting the scheme on behalf of South Africa, said he was glad to hear that a high-power station would be placed at Aden. As soon as that station had been erected, the Union Government would be prepared to consider the advisability of erecting another high-power station to form a necessary link.

Mr. Herbert Samuel suggested that the working expenses and the receipts should be pooled, and any profit or loss divided in an equitable manner to be agreed upon.

The Financial Aspect.

Sir Joseph Ward thought it would be more satisfactory if Australia and New Zealand themselves carried out what they required for their local purposes and agreed to share with the other portions of the Empire the costs of Singapore as a link between the various parts. He supported the proposal generally, it being understood that they were not committing themselves to the details upon which they would later be consulted and upon which they would require their own experts to report.

Mr. Fisher said that no Dominion was more in favour of a British linking-up by a wireless system than Australia. But they in the Commonwealth had started their own scheme and intended to proceed with it. Therefore, they reserved to themselves the right to put up stations where and how they pleased. While supporting the proposed scheme for strategic, protective, and commercial purposes, he wished to make it clear that they were not committing themselves upon the financial side.

The resolution was unanimously agreed to. In addition to the above, there was a discussion on "Cable Rates," and every one of the speakers complained of the high rates charged by the Cable Companies, which were considered oppressive in spite of the concessions announced by Mr. Samuel. The latter, however, suggested that the increasing adoption of wireless telegraphy was having a most potent effect upon the Cable Companies.

Diary of Events.

[*Under this heading we give a monthly record of the progress of Marconi Wireless Telegraphy. Appended are some notable events that have occurred in July of preceding years.*]

1896.

Mr. Marconi conducted experiments before the Officials of the Post Office, first over a distance of about 100 yards, and afterwards between the General Post Office and the Savings Bank Department in Queen Victoria Street. Communication successfully established over a distance of 1¾ miles on Salisbury Plain.

1897.

Trials made at Spezia for the Italian Government, between July 10th and 18th; on the 17th and 18th communication successfully made and maintained between the Arsenal of San Bartolomeo at Spezia and the Italian Cruiser "San Martin" at sea, at distances up to 18 K.M.

The Wireless Telegraph and Signal Company, Limited, incorporated July 20th. The name of the Company changed on February 23rd, 1900, to Marconi Wireless Telegraph Company, Limited.

1898.

On July 20th and 22nd the events of the Kingstown Regatta in Dublin reported by wireless telegraphy for the *Dublin Daily Express*, from the steamer "Flying Huntress," equipped with the Marconi system.

1899.

Three British warships equipped with Marconi apparatus, and messages correctly exchanged between at distances up to 74 nautical miles (about 85 land miles).

1902.

Messages received from Poldhu on Italian battleship "Carlo Alberto" at Cape Skagen, a distance of 800 miles, and at Kronstadt, a distance of 1,600 miles, on July 14th and 16th.

1903.

On July 10th, agreement made for the general use of the Marconi system by the British Admiralty.

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Life on Sable Island.

By G. P. Reeves.

SABLE Island is familiar to passengers on steamers passing in and out of New York Harbour. It is a stretch of land about twelve miles long, but only a quarter of a mile wide, and its highest point is about fifty feet above sea level. The inhabitants barely number a score. The size of the Island, the meagreness of life and

Wireless Station on the Island.

interest to be found there, and its severance from the mainland render it little attractiveness. But the erection thereon of a Marconi station has served to destroy the isolation of the inhabitants and to make the Island less dreaded by navigators. Before wireless was installed on the Island, communication with the mainland, some 160 miles distant, was only possible by the slow and uncertain means of a box kite addressed to the Marine and Fisheries Department, Halifax, N.S. But the new order of things has completely changed all that. News of the outside world is now rapidly obtainable, instead of, as formerly, being three months old; the government steamer is hastily summoned to bring medical aid in cases of sickness, and if any United States fishing boats are found to be within the "three mile limit" a message to Halifax soon brings the cruiser "Canada" to warn off the delinquents.

"M.S.D." Lifeboat.

There are about five hundred small wild ponies on the Island, and the inhabitants are required to assist in driving these ponies into a corral, when a certain number are secured, and sent by steamer to the mainland. Wild duck and small mackerel gulls are plentiful, and numerous seals are to be found in the neighbouring waters. The strong winds drive the sand along with such force that the window panes soon become obscured. Numerous wrecks abound the shore, but these are not of recent occurrence, dating back about twenty years or more.

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The shifting sand of the Island will one day bury these wrecks beneath it, but on another day, when the direction of the wind has changed, many of the wrecks are fully exposed. The last wreck was that of the tramp steamer "Skidby," which is said to have met with disaster owing to the magnetic sand of the Island having affected the needle of the compass. But the cause of this disaster is doubtful, for although in some places black sand is found, it is not magnetic.

Food supplies are brought by a government steamer, which visits the Island every three months. Sometimes the surf is so bad that it is impossible to make any landing, and in the days before wireless telegraphy, it was not unusual for the ship to have to steam away without landing supplies, then return when the wind is dropped. Now, however, it is possible to send wireless messages to the ship advising it of the state of the wind and sea, and thus prevent useless journeys. The life of the wireless operator at M.S.D. is not altogether an enviable one. The spare hours of the day are passed either in shooting, fishing or riding, and at night the smash and crash of the "power" spark are not conducive to sound sleep. Still, even this life is not without its compensations, for wireless telegraphy enables the inhabitants to be kept informed of events in the outer world, and has stimulated new interests in Sable Island.

The Practical Development of Radiotelegraphy.

By Commendatore G. Marconi, LL.D., D.Sc. M.R.I.

A Lecture delivered before the Royal Institution of Great Britain on Friday, June 2nd.)

THE practical application of electric waves to the purposes of wireless telegraphic transmission over long distances has continued to extend to a remarkable degree during the last few years, and many of the difficulties which at the outset appeared almost insurmountable have been gradually overcome—chiefly through the improved knowledge which we have obtained in regard to the subject generally and to the principles involved. The experiments which I have been fortunate enough to be able to carry out on a much larger scale than can be done in ordinary laboratories have made possible the investigation of phenomena often novel and certainly unexpected. Although we have—or believe we have—all the data necessary for the satisfactory production and reception of electric waves, we are yet far from possessing any very exact knowledge concerning the conditions governing the transmission of these waves through space—especially over what may be termed long distances. Although it is now easy to design, construct and operate stations capable of satisfactory commercial working over distances up to 2,500 miles, no clear explanation has yet been given of many absolutely authenticated facts concerning these waves. Some of these hitherto apparent anomalies I shall mention briefly in passing.

Night and Day.

Why is it that when using short waves the distances covered at night are usually enormously greater than those traversed in the day time, whilst when using much longer waves the range of transmission by day and night is about equal and sometimes even greater by day? What explanation has been given of the fact that the night distances obtainable in a north-southerly direction are so much greater than those which can be effected in an east-westerly one? Why is it that mountains and land generally should greatly obstruct the propagation of short waves when sunlight is present, and not during the hours of darkness? The general principles on which practical radiotelegraphy is based are now

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so well known that I need only refer to them in the briefest possible manner.

Wireless telegraphy, which was made possible by the fields of research thrown open by the work of Faraday, Maxwell and Hertz, is operated by electric waves which are created by alternating currents of very high frequency, induced in suitably placed elevated wires or capacity areas. These waves are received or picked up at a distant station on other elevated conductors tuned to the period of the waves, and the latter are revealed to our senses by means of appropriate detectors. My original system as used in 1896 consisted of the arrangement shown diagrammatically in Fig. 1 where an elevated or vertical wire was employed. This wire sometimes terminated in a capacity or was connected to earth through a spark gap.

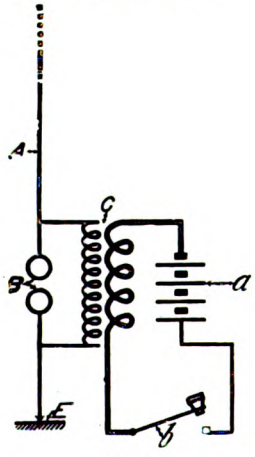

Fig. 1.

By using an induction coil or other source of sufficiently high tension electricity sparks were made to jump across the gap; this gave rise to oscillations of high frequency in the elevated conductor and earth, with the result that energy in the form of electric waves was radiated through space. At the receiving station (Fig. 2) these waves induced oscillatory currents in a conductor containing a detector, in the form of a coherer, which was usually placed between the elevated conductor and earth.

Although this arrangement was extraordinarily efficient in regard to the radiation of electrical energy it had numerous drawbacks. The electrical capacity of the system was very small, with the result that the small amount of energy in the aerial was thrown into space in an exceedingly short period of time. In other words the energy, instead of giving rise to a train of waves, was all dissipated after only a few oscillations and, consequently, anything approaching good tuning between the transmitter and receiver was found to be unobtainable in practice.

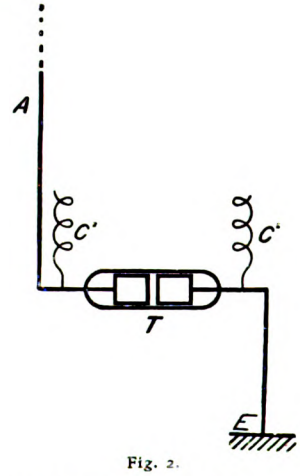

Fig. 2.

Many mechanical analogies could be quoted which show that in order to obtain syntony the operating energy must be supplied in the form of a sufficient number of small oscillations or impulses properly timed. Acoustics furnish numerous examples of this fact—such as the resonance produced by the well-known tuning fork experiment. Other illustrations of this principle may be given, *e.g.*, if a heavy pendulum is set in motion by means of small thrusts or impulses, the latter must be timed to the period of the pendulum, as otherwise its oscillations would not acquire any appreciable amplitude.

In 1900 I first adopted the arrangement which is now in general use and which consists (as shown in Fig. 3) of the inductive association of the elevated radiating wire with a condenser circuit which may be used to store up a considerable amount of electrical energy and impart it at a slow rate to the radiating wire.

As is now well known the oscillations in a condenser circuit can be made to persist for what is electrically a long period of time, and it can be arranged moreover that by means of suitable aerials or antennæ these oscil-

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lations are radiated into space in the form of a series of waves which through their cumulative effect are eminently suitable for enabling good tuning or syntony to be obtained between the transmitter and receiver.

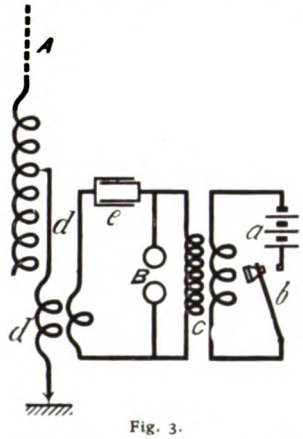

Fig. 3.

The circuits, consisting of the condenser circuit and the elevated aerial or radiating circuit, were more or less closely coupled to each other. By adjusting the inductance in the elevated conductor, and by the employment of the right value of capacity or inductance required in the condenser circuit, the two circuits were brought into electrical resonance, a condition which I first pointed out as being essential in order to obtain efficient radiation and good tuning. The receiver (as shown in Fig. 4) also consists of an elevated conductor or aerial connected to earth or capacity through an oscillating transformer. The latter also contains the condenser and detector, the circuits being made to have approximately the same electrical time period as that of the transmitter circuits.

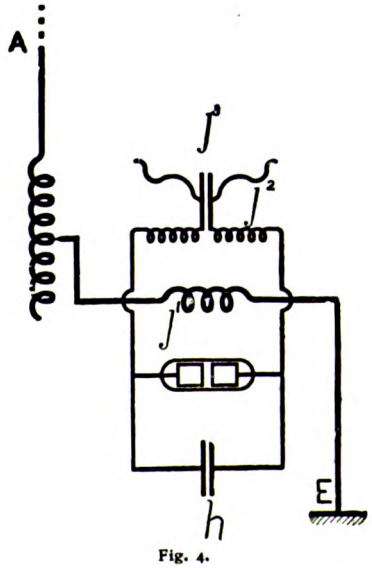

Fig. 4.

Long Distance Stations.

At the long distance station situated at Clifden in Ireland, the arrangement which has given the best results is based substantially upon my syntonic system of 1900, to which have been added numerous improvements. An important innovation from a practical point of view was the adoption at Clifden and Glace Bay of air condensers composed of insulated metallic plates suspended in air at ordinary pressure. In this manner we greatly reduce the loss of energy which would take place in consequence of dielectric hysteresis were a glass or solid dielectric employed. A very considerable economy in working also results from the absence of dielectric breakages, for, should the potential be so raised as to even produce a discharge from plate to plate across the condenser, this does not permanently affect the value of the dielectric, as air is self-healing, and one of the few commodities which can be replaced at a minimum of cost.

Trains of Waves.

Various arrangements have been tried and tested for obtaining continous or very prolonged trains of waves, but it has been my experience that, when utilising the best receivers at present available, it is neither economical nor efficient to attempt to make the waves too continuous. Much better results are obtained when groups of waves are emitted at regular intervals in such manner that their cumulative effect produces a clear musical note in the receiver which is tuned not only to the periodicity of the electric waves transmitted, but also to their group frequency. In this manner the receiver may be doubly tuned with the result that a far greater selectivity can be obtained than by the employment of wave-tuning alone. In fact, it is quite easy to pick up simultaneously different messages transmitted on the same wave length, but syntonised to different group frequencies.

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Wave Tuning.

As far as wave tuning goes, very good results—almost as good as are obtainable by means of continuous oscillations—can be achieved with groups of waves, the decrement of which is in each group ·03 or ·04, which means that about 30 or 40 useful oscillations are radiated before their amplitude has become too small to perceptibly affect the receiver. The condenser circuit at Clifden has a decrement of from ·015 to ·03 for fairly long waves.

This persistency of the oscillations has been obtained by the employment of the system shown in Fig. 5, which I first described in a patent taken out in September, 1907. This method eliminates almost completely the spark gap and its consequent resistance which, as is well known, is the principal cause of the damping or decay of the waves in the usual transmitting circuit.

The apparatus shown in Fig. 5 consists of a metal disc *a* having copper studs firmly fixed at regular intervals in its periphery and placed transversely to its plane. This disc is caused to rotate very rapidly between two other discs *b* by means of a rapidly revolving electric motor or steam turbine. These side discs are also made to slowly turn round in a plane at right angles to that of the middle disc. The connections are as illustrated in the figure. The studs are of such length as to just touch the side discs in passing, and thereby bridge the gap between the latter.

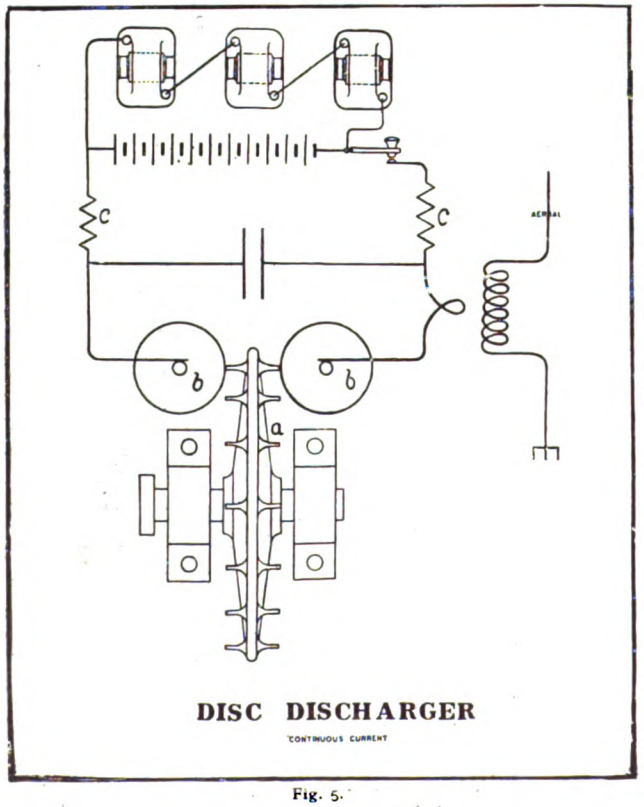

Fig. 5.

High-Frequency Currents.

With the frequency employed at Clifden, namely 45,000, when a potential of 15,000 volts is used on the condenser, the spark gap is practically closed during the time in which one complete oscillation only is taking place, when the peripherical speed of the disc is about 600 feet a second. The result is that the primary circuit can continue oscillating without material loss by resistance in the spark gap. Of course the number of oscillations which can take place is governed by the breadth or thickness of the side discs, the primary circuit being abruptly opened as soon as the studs attached to the middle disc leave the side discs.

This sudden opening of the primary circuit tends to immediately quench any oscillations which may still persist in the condenser circuit; and this fact carries with it a further and not inconsiderable advantage; for, if the coupling of the condenser circuit to the aerial is of a suitable value, the energy of the primary will have practically all passed to the aerial circuit during the period of time in which the primary condenser circuit is closed by the stud filling the gap between the side discs; but, after this, the opening of the gap at the discs prevents the energy returning to the condenser circuit from the aerial as would happen were the ordinary spark gap employed. In this manner the usual reaction which would take place between the aerial and the condenser circuit can be obviated with the result that with this type of discharger and with a suitable degree of coupling the energy is radiated

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from the aerial in the form of a pure wave, the loss from the spark gap resistance being reduced to a minimum.

An interesting feature of the Clifden plant, especially from a practical and engineering point of view, is the regular employment of high-tension direct current for charging the condenser. Continuous current at a potential which is capable of being raised to 20,000 volts is obtained by means of special direct-current generators; these machines charge a storage battery consisting of 6,000 cells all connected in series, and it may be pointed out that this battery is the largest of its kind in existence. The capacity of each cell is 40 ampere hours. When employing the cells alone the working voltage is from 11,000 to 12,000 volts, and when both the direct-current generators and the battery are used together the potential may be raised to 15,000 volts through utilizing the gassing voltage of the storage cells. For a considerable portion of the day the storage battery alone is employed, with a result that for 16 hours out of the 24 no running machinery need be used for operating the station with the single exception of the small motor revolving the disc.

The potential to which the condenser is charged reaches 18,000 volts when that of the battery or generators is 12,000. This potential is obtained in consequence of the rise of potential at the condenser plates, brought about by the rush of current through the choking or inductance coils at each charge. These coils are placed between the battery or generator and the condenser.

Storage Batteries.

No practical difficulty has been encountered either at Clifden or Glace Bay in regard to the insulation and maintenance of these high-tension storage batteries. Satisfactory insulation has been obtained by dividing the battery into small sets or cells placed on separate stands. These stands are suspended on insulators attached to girders fixed in the ceiling of the battery room. A system of switches, which can be all operated electrically and simultaneously, divides the battery into sections, the potential of each section being low enough to enable the cells to be handled without inconvenience or risk.

The arrangement of aerial adopted at Clifden and Glace Bay is shown in Fig. 6. This system which is based on the result of tests which I first described before the Roya Society in June, 1906, not only makes it possible to efficiently radiate and receive waves of any desired length but it also tends to confine the main portion of the radiation to any desired direction. The limitation of transmission to one direction is not very sharply defined, but nevertheless the results obtained are exceedingly useful for practical working. In a similar manner by means of these horizontal wires it is possible to define the bearing or direction of a sending station and also limit the receptivity of the receiver to waves arriving from a given direction.

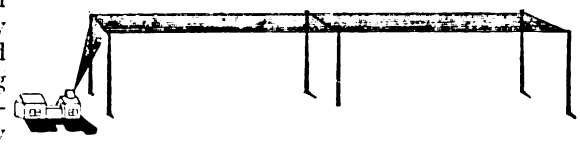

Fig. 6.

The commercial working of radiotelegraphy and the widespread application of the system on shore and afloat in nearly all parts of the world has greatly facilitated the marshalling of facts and the observation of effects. Many of these as I have already stated still await a satisfactory explanation. A curious result which I first noticed over nine years ago in long distance tests carried out on the SS. "Philadelphia" and which still remains an important feature in long distance space telegraphy is the detrimental effect produced by daylight on the propagation of electric waves over great distances. The generally accepted hypothesis of the cause of this absorption of electric waves in sunlight is founded on the belief that the absorption is due to the ionisation of the gaseous molecules of the air affected by the ultra violet light, and as the ultra rays which emanate from the sun are largely absorbed in the upper atmosphere of the earth, it is probable that that portion of the earth's atmosphere which is facing the sun will contain more ions or electrons than that which is in darkness, and therefore, as Sir J. J. Thomson has shown, this illuminated or ionised air will absorb some of the energy of the electric waves. The wave length of the oscillations employed has much to do with this

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interesting phenomenon, long waves being subject to the effect of daylight to a very much lesser degree than are short waves.

Although certain physicists thought some years ago that the daylight effect should be more marked on long waves than on short, the reverse has been my experience; indeed in some transatlantic experiments in which waves about 8,000 metres long were used, the energy received by day at the distant receiving station was usually greater than that obtained at night. Recent observation, however, reveals the interesting fact that the effects vary greatly with the direction in which transmission is taking place; the results obtained when transmitting in a northerly and southerly direction being often altogether different from those observed in the easterly and westerly one. Research in regard to the changes in the strength of the received radiations which are employed for telegraphy across the Atlantic has been recently greatly facilitated by the use of sensitive galvanometers by means of which the strength of the received signals can be measured with a fair degree of accuracy.

In regard to moderate power stations such as are employed on ships and which in compliance with the International Convention use wave lengths of 300 and 600 metres, the distance over which communication can be effected during day time is generally about the same whatever the bearing of the ships to each other or to the land stations—whilst at night interesting and apparently curious results are obtained. Ships, over 1,000 miles away, off the south of Spain or round the coast of Italy can almost always communicate during the hours of darkness with the Post Office stations situated on the coasts of England and Ireland, whilst the same ships, when at a similar distance on the Atlantic to the westward of these islands and on the usual track between England and America, can hardly ever communicate with these shore stations unless by means of specially powerful instruments.

It is also to be noticed that in order to reach ships in the Mediterranean the electric waves have to pass over a large portion of Europe and, in many cases, over the Alps. Such long stretches of land, especially when including very high mountains, constitute as is well known an insurmountable barrier to the propagation of short waves during day time. Although no such obstacles lie between the English and Irish stations and ships in the North Atlantic *en route* for North America a night transmission of 1,000 miles is there of exceptionally rare occurrence. The same effects generally are noticeable when ships are communicating with stations situated on the Atlantic coast of America.

Although high power stations are now used for communicating across the Atlantic Ocean and messages can be sent by day as well as by night, there still exist periods of fairly regular daily occurrence during which the strength of the received signals is at a minimum. Thus in the morning and the evening when, in consequence of the difference in longitude, daylight or darkness extends only part of the way across the ocean, the received signals are at their weakest. It would almost appear as if electric waves in passing from dark space to illuminated space and *vice versa* were reflected and refracted in such manner as to be diverted from the normal path. Later results, however, seem to indicate that it is unlikely that this difficulty would be experienced in telegraphing over equal distances north and south on about the same meridian, as, in this case, the passage from daylight to darkness would occur more rapidly over the whole distance between the two stations.

Beyond 4,000 miles reception could only be carried out during night time. At Buenos Ayres, over 6,000 miles from Clifden, the night signals from both Clifden and Glace Bay were generally good, but their strength suffered some variations. It is rather remarkable that the radiations from Clifden should have been detected at Buenos Ayres so clearly at night time and not at all during the day, whilst in Canada the signals coming from Clifden (2,400 miles distant) are no stronger during the night than they are by day.

Further tests have been carried out recently for the Italian Government between a station situated at Massaua in East Africa and Coltano in Italy. Considerable interest attached to these experiments in view of the fact that the line connecting the two stations passes over exceedingly dry country and across vast stretches of desert, including parts of Abyssinia, the Soudan and the Libyan desert. The distance between the two

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stations is about 2,600 miles. The wave length of the sending station in Africa was too small to allow of transmission being effected during day time, but the results obtained during the hours of darkness were exceedingly good, the received signals being quite steady and readable.

The improvements introduced at Clifden and Glace Bay have had the result of greatly minimising the interference to which wireless transmission over long distances was particularly exposed in the early days. The signals arriving at Clifden from Canada are as a rule easily read through any ordinary electrical atmospheric disturbance. This strengthening of the received signals has moreover made possible the use of recording instruments which not only give a fixed record of the received messages, but are also capable of being operated at a much higher rate of speed than could ever be obtained by means of an operator reading by sound or sight. The record of the signals is obtained by means of photography in the following manner:—A sensitive Einthoven string galvanometer is connected to the magnetic detector or valve receiver, and the deflections of its filament caused by the incoming signals are projected and photographically fixed on a sensitive strip which is moved along at a suitable speed. On some of these records it is interesting to note the characteristic marks and signs produced amongst the signals by natural electric waves or other electrical disturbances of the atmosphere, which, on account of their doubtful origin, have been called "X's."

Lord Rayleigh, in referring to transatlantic radiotelegraphy, stated in a paper read before the Royal Society in May, 1903, that the results which I had obtained in signalling across the Atlantic suggested "a more decided bending or diffraction of the waves round the protuberant earth than had been expected," and further said that it imparted a great interest to the theoretical problem. Professor Fleming, in his book on electric wave telegraphy, gives diagrams showing what may be taken to be a diagrammatic representation of the detachment of semi-loops of electric strain from a simple vertical wire. As will be seen, these waves do not propagate in the same manner as does free radiation from a classical Hertzian oscillator, but instead glide along the surface of the earth.

Conductivity of the Earth.

Professor Zenneck has examined the effect of earthed receiving and transmitting aerials and has endeavoured to show mathematically that when the lines of electrical force, constituting a wave front, pass along a surface of low specific inductive capacity —such as the earth—they become inclined forward, their lower ends being retarded by the resistance of the conductor to which they are attached. It therefore would seem that wireless telegraphy as at present practised is to some extent at least dependent on the conductivity of the earth, and that the difference in operation across long distances of sea compared to over land is sufficiently explained by the fact that sea water is a much better conductor than is land.

The importance or utility of the earth connection has been sometimes questioned, but in my opinion no practical system of wireless telegraphy exists where the instruments are not in some manner connected to earth. By connection to earth I do not necessarily mean an ordinary metallic connection as used for wire telegraphs. The earth wire may have a condenser in series with it, or it may be connected to what is really equivalent, a capacity area placed close to the surface of the ground. It is now perfectly well known that a condenser, if large enough, does not prevent the passage of high-frequency oscillations and therefore in this case, when a so-called balancing capacity is used, the antenna is for all practical purposes connected to earth. I am also of opinion that there is no foundation in the statement which has recently been repeated to the effect that an earth connection is detrimental to good tuning, provided of course that the earth is good. Certainly, in consequence of its resistance what electricians call a bad earth will damp out the oscillations and in that way make tuning difficult; but no such effect is noticed when employing an efficient earth connection.

The Future of Wireless.

In conclusion, I believe that I am not any too bold when I say that wireless

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telegraphy is tending to revolutionise the means of communication from place to place on the earth's surface. For example, commercial messages containing a total of 812,200 words were sent and received between Clifden and Glace Bay from May 1st, 1910, to the end of April, 1911 ; wireless telegraphy has already furnished means of communication between ships and the shore where communication was before practically impossible. The fact that a system of Imperial Wireless Telegraphy was discussed by the Imperial Conference in London (p. 4) shows the supremely important position which radiotelegraphy over long distances has assumed in the short space of one decade. Its importance from a commercial, naval and military point of view has increased very greatly during the last few years as a consequence of the innumerable stations which have been erected or are now in course of construction on various coasts, in inland regions and on board ships in all parts of the world. Notwithstanding this multiplicity of stations and their almost constant operation, I can say from practical experience that mutual interference between properly equipped and efficiently tuned instruments has so far been almost entirely absent. Some interference does without doubt take place between ships, in consequence of the fact that the two wave lengths adopted in accordance with the rules laid down by the International Convention are not sufficient for the proper handling of the very large amount of messages transmitted from the ever increasing number of ships fitted with wireless telegraphy. A considerable advantage would be obtained by the utilisation of a third and longer wave to be employed exclusively for communication over long distances.

In regard to the high power transatlantic stations the facility with which interference has been prevented has to some extent exceeded my expectations. At a receiving station situated at a distance of only eight miles from the powerful sender at Clifden, during a recent demonstration arranged for the Admiralty, messages could be received from Glace Bay without any interference from Clifden when this latter station was transmitting at full power on a wave length differing only 25 per cent. from the wave radiated from Glace Bay. The ratio between the maximum recorded range of Clifden and 8 miles being in the proportion of 750 to 1. Arrangements are being made to permanently send and receive simultaneously at these stations which, when completed, will constitute in effect the duplexing of radiotelegraphic communication between Ireland and Canada. The result which I have last referred to also goes to show that it would be practicable to operate at one time on slightly different wave lengths a great number of long distance stations situated in England and Ireland without danger of mutual interference.

Fundamental Principles.

Although the mathematical theory of electric wave propagation through space was worked out by Clerk Maxwell more than 50 years ago, and notwithstanding all the experimental evidence obtained in laboratories concerning the nature of these waves, yet so far we understand but incompletely the true fundamental principles concerning the manner of propagation of the waves on which wireless telegraph transmission is based. For example, in the early days of wireless telegraphy it was generally believed that the curvature of the earth would constitute an insurmountable obstacle to the transmission of electric waves between widely separated points. For a considerable time not sufficient account was taken of the probable effect of the earth connection, especially in regard to the transmission of oscillations over long distances. Physicists seemed to consider for a long time that wireless telegraphy was solely dependent on the effects of free Hertzian radiation through space, and it was years before the probable effect of the conductivity of the earth was considered and discussed.

The extended use of wireless telegraphy is principally dependent on the ease with which a number of stations can be efficiently worked in the vicinity of each other. Considering that the wave lengths at present in use range from 200 to 23,000 feet, and moreover that wave group tuning and directive systems are now available, it is not difficult to foresee that this comparatively new method of communication is destined to fill a position of the greatest

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importance in facilitating communication throughout the world.

Practical Benefits.

Apart from long distance work the practical value of wireless telegraphy may perhaps be divided into two parts (1) when used for tansmission over sea, (2) when used over land. Many countries, including Italy, Canada and Spain have already supplemented their ordinary telegraph systems by wireless telegraphy installations, but some time must pass before this method of communication will be very largely used for inland purposes in Europe generally, owing to the efficient network of landlines already existing which render further means of communication unnecessary; and therefore it is probable that, at any rate for the present, the main use of radiotelegraphy will be confined to extra-European countries, in some of which climatic conditions and other causes absolutely prohibit the efficient maintenance of landline telegraphy. A proof of this has been afforded by the success which has attended the working of the stations recently erected in Brazil on the Upper Amazon.

By the majority of people the most marvellous side of wireless telegraphy is perhaps considered to be its use at sea. Up to the time of its introduction ships at any appreciable distance from land had no means of getting in touch with the shore throughout the whole duration of their voyage. But those who now make long sea journeys are no longer cut off from the rest of the world; business men can continue to correspond at reasonable rates with their offices in America or Europe; ordinary social messages can be exchanged between passengers and their friends on shore; a daily newspaper is published on board most of the principal liners giving the chief news of the day. Wireless telegraphy has on more than one occasion proved an invaluable aid to the course of justice—a well-known instance of which is the arrest which took place recently through its agency of a notorious criminal when about to land in Canada.

The chief benefit, however, of radiotelegraphy lies in the facility which it affords to ships in distress of communicating their plight to neighbouring vessels or coast stations; that it is now considered indispensable for this reason is shown by the fact that several governments have passed a law making a wireless telegraph installation a compulsory part of the equipment of all passenger boats entering their ports.

An International Congress.

The International Congress of the Applications of Electricity, at Turin, has been definitely fixed for September 10th to September 17th, inclusive. A long and interesting programme of subjects has been promised for discussion, of which two will receive attention in these columns in due course; one being an account of a research on secrecy in wireless telegraphy by Mr. P. O. Pederson, and another on the same subject by Professor Quirino Majorana Calatabiano of Rome.

Wireless in Camp.

One of the most interesting features of the annual "camp" at Farleton, near Milnthorpe, was the successful trials made with a Marconi field apparatus under Brevet-Lieutenant-Colonel Beddington. At the suggestion of General Sir W. H. Mackinnon, who had previously seen it at work in the presence of a distinguished assembly of officers, the operator was quickly in communication with the yeomanry camp 25 miles away. Messages were passing between two camps until 11.30 p.m., after which Colonel Beddington turned it on to the Poldhu wave. It was soon picking up messages from Lizard Point a distance of 400 miles. Communication was maintained up till 2 a.m., during which time Colonel Beddington received much information that did not appear in the morning's newspapers, such as the latest information from the Champagne districts of France, and news about the discovery of a gunpowder plot in Tokio. The Engineer officers who stayed up watching the wireless work were deeply interested. The apparatus was later pulled down and packed away for a 25 miles march back to Farleton. It was mounted on a light carriage, but can easily be carried on horseback.

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The Editor will be pleased to receive contributions; and Illustrated Articles will be particularly welcomed. All such as are, accepted will be paid for.

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Patent Litigation.

An action has been commenced by Marconi's Wireless Telegraph Co., Limited, against the Lodge-Muirhead Wireless and General Telegraphy Syndicate, Limited, for alleged infringement of patent.

Mr. Marconi's Lecture.

In several countries it is already enacted that passenger ships entering their ports must carry a wireless telegraphy installation; this fact was mentioned by Mr. Marconi at the lecture before the Royal Institution of Great Britain, which is reproduced on pp. 7 to 15 of this issue. The lecture brings vividly before the mind the magnificent service done to the world by this great invention. Mr. Marconi made no idle boast when he said that the newest methods used in the wireless system were certain to revolutionise communication throughout the world, and the cordial unanimity with which his statement has been received by the scientific, the engineering and the lay press, is proof of the soundness of his forecast. Italy, Spain, Canada and other States have already commenced to supplement their ordinary telegraphic systems by wireless installations, and Mr. Marconi seems to think that gradually the wireless method will supersede the older everywhere for internal communication. In new and undeveloped countries, wireless telegraphy will never be even supplemented by the cumbrous network of wood and wire, at the mercy of storm and destruction by accident or by human purpose. The whole subject still bristles with mysteries and seems to be on the point of opening the door to natural laws or forces until quite recently not dreamed of. Mr. Marconi has dealt with some of the problems in a lucid and masterly way in his lecture, which should be widely read.

Two Examples and a Moral.

Two incidents which have occurred within the past month deserve to be recalled because they furnish such eloquent evidence of the value of the "Marconi" system. The Managing Director of the Marconi Company had occasion to communicate with Colonel Thys of the Belgian government, but it was found that the Colonel was on his way to the Congo. The only means of sending a message was through Teneriffe, which was then being erected, and has since been opened. This was accordingly done; the message reaching the steamer on the high seas, and a full reply being received (also *via* Teneriffe) at the London Offices of the

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Company in a very short time. Thus, the utility of the new station has been firmly established. When the network of stations now being erected around the coast of Spain is completed, it will have the most important bearings, and to business men in particular it will be an invaluable boon. The other incident shows how wireless telegraphy can come to the aid of the ordinary citizen in an emergency.

A young lady had arranged to leave Parkeston Quay, Harwich, for the Continent, and was accompanied to the steamer by her father. On the ringing of the bell at the starting of the steamer the gentleman hurried ashore, when he found, to his consternation, that he had left his daughter without any money in her possession. Inquiries at the telegraph office elicited the fact that the steamer (it was the SS. "Dresden") had a wireless installation on board, and three-quarters of an hour later he sent a message to the captain of the steamer asking him to furnish the lady passenger with a sum of money. Upon the arrival of the boat at Antwerp the lady wrote home stating that the captain had informed her of the receipt of a wireless message from her father, in accordance with whose desire he offered her sufficient funds to complete her journey. This incident brings home very forcibly the value of the Marconi system in an emergency, and demonstrates the fact that it can now serve the requirements of all sections of the community.

Man v. Machine.

The old bogey of the machine being too far in advance of the man in charge of it has been trotted out in the case of wireless telegraphy. We have heard this complaint applied with more or less appositeness in connection with other branches of industry, and it is not surprising, therefore, that it should now be our turn to receive the lash of the theorist. Speaking recently at a meeting in London, Commander F. G. Loring, the Inspector of Wireless Telegraphs to the G.P.O., said his impression was that the apparatus now supplied to ships was actually in advance of the men who used it. There can be no gainsaying the wonderful strides made in the perfecting of wireless apparatus, which, indeed, is quite in keeping with the rapid development of Mr. Marconi's ideas. The practical application of wireless telegraphy has come with a suddenness which is only to be compared with its demand, and it would occasion no surprise if operators did not reach the highest expectations. There are not the facilities in the training colleges and technical schools that exist for the benefit of the ordinary telegraphist and telephone operator; but thanks to the efforts of the Marconi Company, a really skilful army of operators has been recruited, and, in spite of Commander Loring's remarks, these men are extraordinary good. In skill, intelligence, enthusiasm, and devotion to duty, sometimes carried out under the most trying conditions, the wireless operator will bear favourable comparison with the operator engaged in any other branch of telegraph or telephone work.

The Origin of Atmospherics.

A discussion has been going on in the columns of *The Electrician* respecting the origin of "atmospherics" in wireless telegraphy. Several of the writers appear to overlook the fact that Mr. Marconi proposed the use of directive aerials for the investigation of the origin of "atmospherics" some time before any of the experiments mentioned by them. Mr. Marconi pointed out in a letter which appeared in a recent issue of our contemporary that he dealt with the subject in a paper before the Royal Society on March 15th, 1906. Mr. Marconi showed in that paper (*Proceedings* of the Royal Society A. Vol. lxxvii., 1906) that when using horizontal receiving wires arranged as described in his communication, he often noticed that the natural electrical perturbations of the atmosphere or stray electric waves, which were generally prevalent during the summer, appeared to proceed from certain definite directions which varied from time to time. Thus, on certain days, the receiving instruments when connected to wires which were oriented in such a way as to possess a maximum receptivity for electric waves coming from the south would give strong indications of the presence of these natural electric waves, whilst on differently oriented wires the effects were at the same time weaker or imperceptible. On other days these natural electric waves might apparently come from other directions. He

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added that it would be exceedingly interesting to investigate whether there existed any relation between the direction of origin of these waves and the known bearing or direction of distant terrestrial or celestial storms from whence these stray electric waves most probably originated.

Exploring the Earth's Interior.

Of all the novel applications of wireless telegraphy, perhaps the most unique is that proposed by Dr. H. Löwy, of Göttingen, for exploring the interior of the earth. A German scientific journal contains a long and elaborate account of Dr. Löwy's researches in connection with this matter; from which it is seen that either what is known as the reflection method or the absorption method is employed. In the former case, an antenna, which we will call T, is mounted on the earth, not vertically, but at an angle, and another antenna, R, is mounted some distance away. Directed waves are sent from T, and received at R, the intensity of these received waves being determined while the inclination of R is varied. If there is between T and R a layer of minerals in the ground, which acts as reflector for the electric waves, then two maxima will be observed in R, the one due to the direct transmission of the waves through the air, and the other due to the waves reflected in the ground. From the inclination of R, corresponding to the second maximum, the position of the reflecting layer can be estimated. The absorption method requires holes to be bored into the ground, 100 metres or more in depth, and deep enough to receive an antenna of 80 metres in height, such that the equatorial plane of the waves—*i.e.*, the plane in which the main transmission would take place—would be in dry ground. Three parallel holes are required; the central one contains the transmitter, and the other two receivers. If there is no metal between the two receivers, the intensities of the waves required will be equal if the distance between one receiver and the transmitter is equal to that of the transmitter and the other receiver; the existence of any metal between the transmitter and the second receiver will appear in a distinct weakening of the waves.

Company News.

The Share Market.

Though the Coronation holidays interfered more or less with business on the London Stock Exchange during June, Marconi shares were very prominent in the Industrial Section. There was great activity in this market, and the prospects were favourably discussed. The closing prices quoted on June 30th were as under:—

Ordinary	46/-	47/-
Preference	42/6	45/-

Marconi International Marine Communication Company.

The annual meeting of the Marconi International Marine Communication Company was held at the offices of the Company in London on June 29th, Mr. S. Flood Page being inthe chair. Mr. G. Marconi was also present.

The report and accounts were duly received, approved and adopted. Commendatore G. Marconi and Mr. Alfonso Marconi, the retiring Directors, were re-elected, and the recommendation of the Board "that a dividend at the rate of 5 per cent. for the year ending December 31st, 1910, on the capital paid up at that date be paid on August 1st, 1911, to the members who are now on the register" was also carried.

In addressing the meeting, the Managing Director, Mr. Godfrey Isaacs, said:—"You are probably quite aware that this Company holds an exclusive licence from Marconi's Wireless Telegraph Company for the right to install and work the Marconi system of Wireless Telegraphy on board merchant and pleasure vessels which fly the flags of certain countries, including Great Britain, and you will have learned from the Report that to December 31st, 1910, the number of telegraph stations installed had increased from 143 in the previous year to 250, and that to the date of Report this number had still further appreciated to the figure of 303. The Directors are satisfied from the orders in hand that the same rate of progress will at least be maintained, and they think they are not over sanguine in estimating that at

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the end of the current year the stations at work upon the high seas will number about 400. Needless to say, that with the growing number of telegraph stations so proportionately does our revenue increase, and it is a satisfactory feature in this business that the working expenses do not grow in the same proportion as does the revenue.

In recent times a very considerable development has been given to wireless telegraphy, and many new coast telegraph stations have been, and are being, erected in all parts of the world; there is therefore much greater facility to communicate from the high seas to the land and from the land to the high seas. We find consequently that our telegraph receipts increase, and we are confident that they will continue to increase in same ratio to the increase in the number of land stations. The travelling public is also becoming more accustomed to keep in touch both socially and commercially with those at home, and the more general this habit becomes so of course will the telegraphic receipts increase. There is also quite a considerable revenue derived from communications between ship and ship, and the increase in the number of ships installed with wireless telegraph stations of course necessarily increases the revenue from this source.

At the last General Meeting the Directors were able to express their confidence that the business would continue to show considerable extension. From the foregoing remarks the shareholders will, I am sure, endorse the opinion of the Board that a further considerably improved position will be shown at this time next year. Since the last General Meeting the Directors have done me the honour of appointing me Managing Director of this Company. It is an honour which I highly appreciate for, in the first instance, I can conceive no more enviable a position than that of directing a business which, apart from serving so great a commercial and social utility, serves an even infinitely higher purpose, that of eliminating the danger from travel at sea, and saving thousands of lives, for which the whole world is indebted to Mr. Marconi. In the second case, it is extremely satisfactory to have the direction of a business of such magnitude and so full of promise financially to all those interested in it.

Marconi Wireless Telegraph Co. of New York.

The report of the Marconi Wireless Telegraph Co. of New York, for the year ended January 31st last, states that, allowing for the usual depreciation (10 per cent.) on station and experimental work, the balance shows that the company is more than self-supporting. During the year the company sent and received 2,291 messages, containing 34,130 words more in 1910 than it did in 1909, and the money gain over 1909 in favour of 1910 was about $4,000. Over $11,000 was written off as depreciation, bringing the stations, etc., into a condition highly commended by the accountants. The loss of $1,700 shown in general working was caused by the opening and running of stations on the east coast, south of New York, which stations will eventually be most useful and, probably, paying, in connection with coastwise boats that the company are gradually acquiring as part of the Marconi equipped fleet. The aim is to control the whole of this business in the same way that the system operates the transatlantic liners. The number of commercial ship stations owned and controlled by the company and allied Marconi companies is constantly increasing, and there are now 469 steamships trading to America and various ports of the world fitted with the Marconi system; nine pleasure yachts are also fitted and have working arrangements by which the shore stations communicate with, send and take messages to and from 68 commercial vessels fitted or operated by companies with which this company has commercial dealings. Since the last meeting, four stations have been erected and equipped on the east coast of America south of New York, as follows:—Cape May, N.J.; Virginia Beach, Va.; Fernandina and Palm Beach, Fla. (working arrangements are in existence whereby the company uses the Government station at Key West); and is about to put up a station intermediate and between Virginia Beach and Fernandina, so that with the established stations north of New York a vessel sailing from Maine to Florida can be in communication the whole time. The Wellman airship, which started from Atlantic City to cross the Atlantic, was fitted with the Marconi apparatus. Successful work has also been done in connection with submarines.

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Experiments recently conducted in England look to the acceleration of plant life by electrical treatment. It is stated that by such treatment small fruits can be brought to maturity weeks earlier, and the production of vegetables and large fruits can be much increased. If so, a new field opens for wireless. While the SS. "Princess Irene" was ashore recently, the operator thereon sent and received over 10,000 words. In 1910 the use of transatlantic wireless was offered to the American public, which was quick to avail itself of the great financial advantage offered by the Marconi system, the rate from New York to all points of the United Kingdom being 8c. a word lower than cables, and to the Continent in like proportion. A large, increasing and satisfactory business is now being done by the Marconi system in this work, and merchants, brokers and others having large interests abroad fully realise that excellent and reliable communications can be had by means of the Marconi system at considerably reduced rates. The strength of the Marconi system has been greatly added to this year by a decisive judgment obtained in the High Court of England in the action brought by Marconi's Wireless Telegraph Co. Ltd., against British Radiotelegraph and Telephone Co., wherein the Judge held that the defendant company had been infringing the Marconi patent 7,777, relating chiefly to tuning devices, and about which the English company writes as follows:—"The result of this action goes not only to prove the infringement of our patents by the British Radiotelegraph and Telephone Co., but also that all other so-called systems of wireless telegraphy, with or without variations, are infringements of the Marconi tuning patents." The Judge's decision was so carefully considered that an appeal was deemed useless, and the defendant company undertook to dismantle its stations and cease infringing. In the United States the company holds a patent almost identical with the above as to specifications and claims, which said patent was granted in 1904, and steps are now being taken to prove and sustain said patent by actions in the proper Courts of law against manufacturers and users, and it is the intention of the company to carry such actions on to a final issue and determination with the least possible delay.

Land Stations in Spain.

Teneriffe.

The Cia. Nacional de Telegrafia sin Hilos have received permission to open the Teneriffe station (which has been built by the Marconi Wireless Telegraph Co.) for communication with ships. This station was opened on June 25th. Both this and the Las Palmas station, the opening of which was fixed for a few days later, will be very busy stations, as they will handle all the traffic of ships travelling between Europe and South America and Africa, and also that of ships going to Australia which take the Cape Route. It will only be a very few days before the long wave plants at the Teneriffe station and the Las Palmas station will also be ready for communication with Cadiz. The ranges of these stations will be 1,600 kilometers on the long wave. The Cadiz station is also ready for service, both as regards communication with Teneriffe and Las Palmas, and with ships at sea.

Cadiz.

The preliminary trials of the Cadiz station have been very satisfactory, strong readable signals having been received at all hours during the day and night. These stations are all equipped with a musical note. The Vigo station is progressing satisfactorily. This station is built on a flat topped mountain in a position commanding the whole of the Bay of Vigo, and when this station is also put into service, ships at sea will be able to remain in communication with land from the commencement of their voyage until they have gone a long way south of Teneriffe. The Barcelona station is also nearing completion.

The site for the station to be erected in the Balearic Islands has been chosen at the little port of Soller, which is situated on the north-west coast of the Island of Mallorca, and the work of the construction of the station is being put in hand at once.

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Notes on Books.

"A HANDBOOK OF WIRELESS TELEGRAPHY," by Dr. J. Erskine-Murray. (Crosby, Lockwood & Son, 10s. 6d.)

The fact that a third edition of Dr. Erskine-Murray's book has been called for shows what rapid progress the subject has made, and how keen is the desire of technical men, as well as the general public, to keep abreast of the advances made in wireless telegraphy. The first edition was published in 1907 and it was followed two years later by a second edition. After an interval of another two years the third edition makes its appearance. The latest edition bears traces of thorough revision; a considerable amount of new matter has been introduced, much of it from information supplied by Mr. Marconi, including the very interesting record of the transatlantic message transmitted from Glace Bay, N.S., to Clifden, which was shown in the June issue of *The Marconigraph*, and which forms the frontispiece to Dr. Erskine-Murray's book. As the volume reached us only a few days before going to press with our present issue, we have been unable, in the little time at our disposal, to deal with the contents on its merits, and we must therefore hold over our full review until the next issue.

Of the applications to which electricity is put at the present day, the variety is legion. In "ELECTRICITY IN THE SERVICE OF MAN" (Cassell, 7s. 6d. net), an attempt has been made to arrange and describe in a popular manner its many uses. The book is a new edition of a work which has been before the public for the last twenty-three years, when it consisted chiefly of a translation from the German of Dr. Urbanitzky. After the third edition, which appeared in 1893, with numerous e ditions by the present author, the enormous multiplication of electrical appliances necessitated the enlargement of the work. Subsequent developments have again rendered it convenient for purpose of treatment to adopt further modification, and the present volume is the result of these later efforts to secure harmony of arrangement in the matter dealt with. Dr. Walmsley handles the principles of magnetism, static electricity, dynamic phenomena, the voltaic currents, and continuous currents. This is a plainly written book. It starts in each section at the beginning, shows step by step how advance has been gained, and who have helped it on; illustrates different instruments, experiments and theories, and generally brings the students' knowledge abreast of the best information.

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Wireless and the Coronation.

THE thoughts paramount with the British public during the month of June were inspired almost solely by the Coronation. An indication of the public interests in the event, and of national feeling for the central figures—King George V. and his gracious consort Queen Mary—is to be found in the universal manifestations of loyal affection displayed of the citizens of this great Empire. It is but natural, therefore, that advantage should be taken of the occasion to reflect upon the growth and development of England and her sister nations in this great Imperial family, and that comparisons should be made with the conditions prevailing at the previous Coronation. Within that decade, many notable developments have taken place, only one of which it is necessary for us to refer to here. This is not the time to deal specifically with the importance and value, both commercial and scientific, of radio-telegraphy; but we can make use of the occasion to explain the part taken by wireless in the Coronation festivities on sea and on land, so that a fair estimate may be formed of its utility and adaptability for any occasion. The great Naval Review, held on June 24th, was an event, the size and significance of which was perhaps unparalleled in modern times, and formed a fitting climax to Coronation week. A correspondent who was present at Spithead on this memorable occasion has sent us an account of the great Review, and we cannot do better than print his graphic picture, showing in its true perspective the part played by wireless.

At the Naval Review

By J. R. Stapleton

During Coronation week the newspapers were flooded with particulars relating to, and contrasting, the Fleet that assembled in 1902 at the Review held after the Coronation of King Edward VII., and that anchored at Spithead on June 24th last. These comparisons served to show the tremendous strides that had taken place in naval construction and equipment during the past decade. But it was not only in armaments in the huge steel hulls and the enormous barbettes that improvements were noticeable; a great and wonderful change met the eye of the keen observer as he gazed up at the forest of masts assembled there, for he saw strung from and hung between them a weird cage-like network of wires, from which he knew that each vessel so equipped was installed with a wireless installation. Fully ninety per cent. of all the ships (not counting the yachts and smaller craft) at Spithead carried wireless plant. When it is remembered that at the Naval Review in 1902, less than ten per cent. of the ships assembled were fitted with wireless apparatus, it causes one "furiously to think." At the earlier date, wireless was regarded merely as a novelty, or some huge and elaborate scientific toy—the product of a brilliant and fertile mind; it played but a minor part in the naval arrangements made for the occasion. The contrast between 1902 and 1911 is most remarkable. No longer is the question, "Is wireless really practicable?" One really asks now, "What would we do without it?" Instructions, orders, and commands that were formerly communicated by means of flag signals or flashlights were transmitted along invisible waves from ship to ship to the immense satisfaction of the Admirals in charge. The ordinary visitor to the Review could not fail to observe the advance made in wireless during the past few years; nor did it fail to impress him. But if this progress was so apparent to the visitor, how much more so was it to the operator who sat with telephones attached to his ears and heard the almost continuous communications that were going on at the time of the Review.

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The use to which wireless would be put during the Review was foreseen by the Postal Authorities, and in order to avoid interference with naval and commercial communications to and from ships in the neighbourhood of the Isle of Wight, the Postmaster-General issued the following regulations for the guidance of wireless operators employed on ships attending the Review :—

1. The Post Office Wireless Station at Niton, Isle of Wight (Call Signal GNI), will be the controlling station, and all operators are to comply strictly with any instructions given by that station, which will determine, in accordance with sections XIX. and XXIII. of the Regulations attached to the International Radiotelegraphic Convention, the order in which the ship stations should be allowed to transmit their correspondence.

2. Intercommunication between ships (other than ships of the Royal Navy) in the neighbourhood of the Isle of Wight must cease immediately at the request of the Post Office Wireless Station at Niton, in accordance with section XL. of the Regulations referred to above.

3. All Radiotelegrams, whether addressed to places in the United Kingdom or abroad, are to be transmitted via the Niton Station, where special arrangements have been made for dealing with the traffic.

4. A wave length of 300 metres should be used for all communications in order to minimize the risk of interference with Naval signalling.

5. The charge for the Radiotelegrams will be made up of—(1) the ship charge ; (2) the Coast Station charge (6d. a word without minimum) ; (3) "Wire" charge ; that is, the ordinary telegraph charge to places in the United Kingdom or abroad.

It was but natural that with such an unprecedented number of ships assembled within a short radius, some provision should be made for obviating interference. About 150 ships were fitted with wireless, 15 of them being merchant vessels carrying spectators. The possibility of interference was admirably overcome by tuning, the Naval vessels being worked on a 3,000 feet wave-length, and the merchant boats on a 1,000 ft. wave length. The Niton Station, controlled by the State, was set apart to deal with merchant ships, while the Naval vessels were worked by the Admiralty Station at Portsmouth. A large volume of traffic passed between the two stations. I was on board the "Themistocles"—a merchant ship chartered to take the Admiralty and War Office Officials, and my attention was naturally drawn to the working of the Niton Station. I have nought but praise for the operators on duty there ; they worked incessantly under the arduous conditions, and with complete success. Facility was given as far as possible to each ship to "clear," and yeoman service was rendered by Niton, which resulted in a tremendous amount of press and ordinary messages being transmitted and received through that station. I have not at hand the exact number of messages dealt with during the Naval Review, but I know it must have been enormous. To quote one ship alone, I heard the French

At the Naval Review.

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steamer, "La Savoie," sent between 8 a.m. and noon over 70 messages to Niton, and when we left for Southampton at 6 p.m., that ship was still transmitting. This only applies to one ship, but I heard in addition that traffic was passing between the "Otranto," the "Batavia III.," the "Ascania," the "George Washington," and others.

Time prevents me from dwelling further upon the work done, and from showing the extent to which wireless was used during the Naval manœuvres; but I think it will be saying the very least when I add that it did play a most important part, and was used to great advantage. It supplied the Fleet with a daily news bulletin, and was the means of conveying to friends ashore assurances that the weather conditions were superb, and everything a huge success. It must have been a great satisfaction to those who have been instrumental in making wireless a practicability, to see it attain such a standard of perfection in so short a space of time. Never before have so many wireless installations been assembled together in the world's history, and it will be long before I forget steaming through twenty miles of aerials, as it was my privilege to do on that memorable Saturday morning when the "Themistocles" proceeded through the lines of the Fleet, and finally came to her anchorage.

Coronation Celebrations at Chelmsford.

(*From a Correspondent.*)

Festivities of a nature befitting the position of this borough as the capital of Essex, and the town in which the Marconi Company's works are situated, were decided on some months ago, and were brought to a successful issue on June 22nd. The sum of £500 was voted by the Corporation, and with the aid of an enthusiastic committee numerous entertainments were provided for the amusement of all, young and old. The round of festivities commenced with services in the Churches at 11 in the morning and terminated with a ball in the Drill Hall, lasting until 3.30 a.m. on June 23rd.

On the conclusion of the morning services a large procession was formed, and wended its way through the main streets of the town to the spacious and beautiful Recreation Ground, where a brief service was held. This was followed by the firing of a *feu de joie* by the contingents of the Territorials present, and then by an eagerly anticipated demonstration of Wireless Telegraphy. For this purpose one of the Marconi Company's latest type of Cavalry Field Stations had been erected in the Recreation Ground, by means of which wireless communication was maintained with the Company's works, about three quarters of a mile distant, and it had been arranged that on receipt of a signal here a Union Jack should be broken at the head of the mast, which is of the Company's latest type of sectional steel construction, and reaches the towering height of 230 ft. In the absence of the Mayor (Mr. Alderman J. D. Cramphorn), who was commanded to attend the Coronation ceremony in Westminster Abbey, the signal was given by the Deputy Mayor, Councillor E. C. Gray. As this gentleman proceeded to the wireless station the silence was so intense as to be almost audible, and was only broken by the noise of the spark when he commenced to send the signal, but was changed to a scene of almost indescribable enthusiasm in the space of five seconds, when the Union Jack at the mast head floated proudly on the breeze, followed immediately by the flags on the staffs of the Recreation Ground and the Pro-Cathedral. The wireless installation was kept on the ground for some hours afterwards as a receiving station, and many interested spectators exercised the privilege of hearing signals transmitted from the works.

A wireless station has now been opened on the island of Bonaire. The charge for the transmission of messages abroad is 2fl. (3s. 4d.) for the first 10 words, and ·2fl. (4d.) for each additional word.

It has been suggested that the best method of filtering out the true atmospheric disturbance is to work with a low aerial and large capacity.

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Revised Rates for Radiotelegrams.

A Post Office Circular (No. 1998) has been issued, setting forth the revised rates for radiotelegrams exchanged with cross-channel ships and other vessels making short voyages. The revised rates came into force on July 1st, and at present apply to the services set out in the following table :—

Service.	Ships.	Coast Station.	Charges. per word.	Charges. Minimum.
Batavier Packets— London—Rotterdam	Batavier II.	North Foreland	2½d.	2s. 1d.
	,, III.	North Foreland	2½d.	2s. 1d.
	,, IV.	Scheveningen Haven	2½d. §	2s. 1d.§
	,, V.	Scheveningen Haven	2½d. §	2s. 1d.§
Belgian Government Packets— Dover—Ostend	Jan Breydel	Nieuport	1d.§ (after 10 words)	1s. 3d.§ (for 10 words and under).
	La Flandre	Nieuport	1d.§ (after 10 words)	1s. 3d.§ (for 10 words and under).
	Leopold II.	Nieuport	1d.§ (after 10 words)	1s. 3d.§ (for 10 words and under).
	Le Rapide	Nieuport	1d.§ (after 10 words)	1s. 3d.§ (for 10 words and under).
	Marie Henriette	Nieuport	1d.§ (after 10 words)	1s. 3d.§ (for 10 words and under).
	Pieter de Coninck	Nieuport	1d.§ (after 10 words)	1s. 3d.§ (for 10 words and under).
	Princesse Clementine	Nieuport	1d.§ (after 10 words)	1s. 3d.§ (for 10 words and under).
	Princesse Elisabeth	Nieuport	1d.§ (after 10 words)	1s. 3d.§ (for 10 words and under).
	Princesse Henriette	Nieuport	1d.§ (after 10 words)	1s. 3d.§ (for 10 words and under).
	Princesse Josephine	Nieuport	1d.§ (after 10 words)	1s. 3d.§ (for 10 words and under).
	Ville de Douvres	Nieuport	1d.§ (after 10 words)	1s. 3d.§ (for 10 words and under).
City of Dublin Steam Packet Company's Mail Steamers— Holyhead—Kingstown	Ulster	Seaforth	2½d.	2s. 1d.
	Munster	Seaforth	2½d.	2s. 1d.
	Leinster	Seaforth	2½d.	2s. 1d.
	Connaught	Seaforth	2½d.	2s. 1d.
Gt. Eastern Railway Company's Mail Steamers— Harwich—Hook of Holland	Amsterdam	Parkeston Quay	2d.§	1s. 8d.§
	Brussels	Parkeston Quay	2d.§	1s. 8d.§
	Colchester	Parkeston Quay	2d.§	1s. 8d.§
Harwich—Antwerp	Copenhagen	Scheveningen Haven	3d.§	2s. 6d.§
	Dresden	Scheveningen Haven	3d.§	2s. 6d.§
	Munich	Scheveningen Haven	3d.§	2s. 6d.§
	St. Petersburg	Scheveningen Haven	3d.§	2s. 6d.§
	Vienna	Scheveningen Haven	3d.§	2s. 6d.§
London & North-Western Railway Co.'s Mail Steamers— Holyhead—Kingstown and Dublin (North Wall)	Anglia	Seaforth	2½d.	2s. 1d.
	Cambria	Seaforth	2½d.	2s. 1d.
	Hibernia	Seaforth	2½d.	2s. 1d.
	Scotia	Seaforth	2½d.	2s. 1d.
Midland Railway Company's Mail Steamers— Heysham—Belfast	Antrim	Heysham Harbour	1d.	1s.
	Donegal	Heysham Harbour	1d.	1s.
	Londonderry	Heysham Harbour	1d.	1s.
South Eastern and Chatham Railway Co.'s Mail Steamers— Folkestone—Boulogne	Invicta	North Foreland	3½d.	2s. 11d.
	Queen	North Foreland	3½d.	2s. 11d.
Dover—Calais	Empress	North Foreland	3½d.	2s. 11d.
	Victoria	North Foreland	3½d.	2s. 11d.
	Onward	North Foreland	3½d.	2s. 11d.
Wilson Line Royal Mail Steamers— Hull—Norway	Aaro	Caister—Cullercoats	5d.	2s. 6d.
	Oslo	Caister—Cullercoats	5d.	2s. 6d.
Hull—Sweden	Eskimo	Caister—Cullercoats	5d.	2s. 6d.
	Calypso	Caister—Cullercoats	5d.	2s. 6d.
Zeeland Company's Packets— Queensborough—Flushing	Koningin Regentes	North Foreland	4d.	3s. 4d.
	Koningin Wilhelmina	North Foreland	4d.	3s. 4d.
Folkestone—Flushing	Mecklenburg	Scheveningen Haven	2d.§	1s. 8d.§
	Oranje Nassau	Scheveningen Haven	2d.§	1s. 8d.§
	Prinses Juliana	Scheveningen Haven	2d.§	1s. 8d.§
	Prins Hendrik	Scheveningen Haven	2d.§	1s. 8d.§

§ The ordinary charge for wire transmission to the coast station must be added.

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The United States and Wireless

Compulsory Equipment of Ships.

THE effects of an Act which came intoforce in the United States on July 1st are likely to be far-reaching. In brief, this Act provides for the equipment of every ocean-going steamer leaving a United States port, and carrying fifty or more persons, including passengers or crew, with "an efficient apparatus for radio-communication, in good working order, in charge of a person skilled in the use of such apparatus, which apparatus shall be capable of transmitting and receiving messages over a distance of at least one hundred miles, night or day." This Act applies to vessels whether registered in the United States or in any foreign country, but it does not include vessels plying between ports less than 200 miles apart.

Three wireless ship inspectors have been appointed, one in the North Atlantic from New York to the Canadian boundary; another in middle Atlantic and gulf, from Philadelphia to Galveston, including Porto Rico; and the third is stationed in the Pacific from Puget Sound to San Diego, including Alaska and Hawaii. The Act empowers collectors of customs as well as wireless ship inspectors to visit ocean passenger steamers before they leave port, and as certain if they are equipped with the apparatus in charge of the operator.

Where an ocean passenger steamer subject to the Act is without the apparatus and the operator prescribed, or either of them, and is about to attempt to leave port, the customs officer or wireless ship inspector visiting the vessel shall (*a*) notify the master of the fine to which he will be liable, and of the particulars in respect of which the law has not been complied with; (*b*) communicate with the collector of customs and, (*c*) prepare in writing a report of his action. The Act does not authorise the refusal of clearance in case of violation of its provisions, but it specifically provides for the imposition of a fine in a sum not more than five thousand dollars upon conviction by the court. The collector of customs, accordingly, when advised that an ocean passenger steamer is subject to the Act is attempting to leave port in violation of its requirements, must at once notify the United States attorney. Subsequently he shall report the case briefly to the Secretary of Commerce and Labour.

Vessels entering a port of the United States are not subject to the Act, but customs officers and wireless ship inspectors may accept as evidence of the efficiency of the apparatus and the skill of the operator wireless messages shown to have been transmitted and received by him over a distance of at least one hundred miles, by night or day, during the voyage to the United States. In cases of violations of the Act the efficiency of the apparatus and the skill of the operator will be determined by the court.

The second section of the Act deals with operators, and is prefaced by the excerpts of Article VI. of the Service regulations annexed to the Berlin International Radiotelegraphic Convention:

> The service of the ship station must be carried on by a telegraphist holding a certificate issued by the Government to whose authority the ship is subject. This certificate testifies to the technical proficiency of the telegraphist as regards—(*a*) the adjustment of apparatus; (*b*) transmission and sound-reading at a speed which must not fall short of 20 words a minute; (*c*) knowledge of the regulations applicable to the exchange of radiotelegraphic traffic.
>
> In addition, the certificate testifies that the Government has bound the telegraphist to the obligation of preserving the secrecy of correspondence.

The Berlin Convention has been ratified by Great Britain, Canada, Australia, British South Africa, India and New Zealand, Germany and all German protectorates, France, Norway, Japan, the Netherlands and Dutch Indies, Russia, Sweden, Austria-Hungary, Spain, Denmark, Belgium, Brazil, Turkey, Portugal, Roumania, Mexico, Bulgaria, Persia, and Tunis. Wireless operators holding valid certificates issued by the Governments named above will be recognised as persons "skilled in the use of such apparatus" within the meaning of the Act, unless in the case of a specific individual there may be special reason to doubt the operator's skill and reliability. These certificates will be issued by the Commissioner of Navigation after examination.

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The apparatus forms the subject of the third portion of the Act. The efficiency of the wireless apparatus which has been certified by a foreign government will be recognised in the United States, but this will not prevent a customs officer or wireless ship inspector testing the apparatus himself to see that it is in good working order. The current necessary to transmit and receive messages must at all times while the steamer is under way be available for the wireless operator's use. A storage battery or some other auxiliary which will produce sufficient power to operate the transmitting apparatus for four hours, ordinary sending, should be installed and ready for use in case of mishap to the electric plant of the vessel. After January 1st, 1912, vessels will be required to carry such battery or auxiliary.

We reproduce below Navigation Service Form 751, which is a copy of the operator's certificate and skill in radio-communication. This certificate is valid for two years.

This is to certify that, under the provisions of the Act of June 24th, 1910, ——— ——— has been examined in radio-communication and has passed in :

(*a*) The adjustment of apparatus, correction of faults, and change from one wave length to another ;

(*b*) Transmission and sound reading at a speed of not less than fifteen words a minute, American Morse, twelve words, Continental, five letters counting as one word.

The candidate's practical knowledge of adjustment was tested on a ——— set of apparatus. His knowledge of other systems and of international radiotelegraphic regulations and American naval wireless regulations is shown below : ——— ——— ———.

(Signature of examining officer) ——— ———

Place———— ——, Date———— —, 101

By direction of the Secretary of Commerce and Labour :

———— ———,

Commmissioner of Navigation, Washington D.C

I, ——— ———, do solemnly swear that I will faithfully preserve the secrecy of all messages coming to my knowledge through my employment under this certificate ; that this obligation is taken freely, without mental reservation or purpose of evasion ; and that I will well and faithfully discharge the duties of the office : So help me God.

(Signature of holder) ——— — —.

Date of birth, ——— ———, ———

Place of birth, ——— ———, ———.

Sworn to and subscribed before me this —— day of ——, A.D. 101 .

[SEAL.] ——— ———, *Notary Public.*

The Equipment of SS. "Olympic."

New York welcomed the "Olympic" on her arrival in port on June 21st with an enthusiasm which, as one writer said, baffled description. The "Olympic's" success on her maiden trip was reported in the daily papers by means of Marconigrams before the arrival of the vessel in port. An extraordinary incident occurred as the "Olympic" was passing through the lower bay. Mr. Thomas Sopwith, the English aviator, hovered over the steamer in his aeroplane and dropped aboard a pair of spectacles carefully wrapped and addressed to Mr. W. A. Burpee, a prominent Philadelphia merchant. Mr. Burpee had broken his spectacles shortly before sailing, and sent them to Wanamaker's store for repairs. Just before the "Olympic" sailed Mr. Burpee sent a wireless message to Wanamaker's, which has a wireless installation, requesting that the spectacles be sent to him in London. Taking advantage of Mr. Sopwith's ascent, Wanamaker's sent a wireless message to Mr. Burpee that the spectacles would be delivered by aeroplane. Mr. Sopwith was then engaged to make the delivery, which was safely accomplished.

So great is the public interest in this mammoth liner, that a brief description of her wireless equipment will be of interest. Shortly before leaving Southampton she was fitted with a 5 K.W. motor generator set, and the latest type of valve receiver was installed as a standby. The installation is designed to provide, when employed with a suitable aerial having a mean height of 170 feet, a working range of 250 N. miles over water, and a maximum range considerably exceeding the above figure. It is arranged to tune in transmission to waves of 300 and 600 metres, and to tune in reception to all waves between 100 and 2,500 metres. Two masts, 200 ft. in height, stepped 600 ft. apart, are used for the support of the aerial, which is of the twin T type, one aerial only of appropriate type being employed for the double purpose of transmitting and receiving. The earth connection is made by insulated cable to convenient points on the hull of the vessel.

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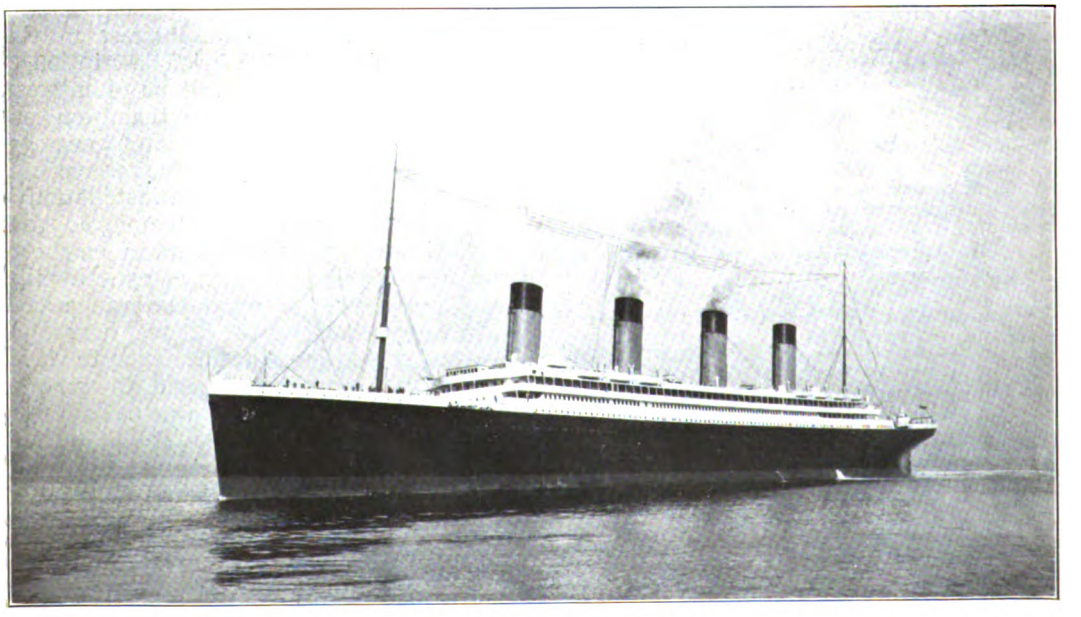
Electrical power is supplied at 110 volts (continuous current) for the purpose of running the plant. This, too, consists of a motor generator set, comprising a continuous current motor mounted on a common bed with and direct coupled to an alternating current generator. The motor takes its power from the continuous current supply, and furnishes mechanical power to the laternator sufficient for an output of 5 K.W. at 300 volt.

The manipulating gear consists of a Morse key, actuating electrically an electro-magnetic relay key in the transformer primary circuit. The Morse key is provided with telephone short circuiting contacts to prevent the operator's ear being rendered insensitive by noise in the telephone during transmission.

The receiver is a standard magnetic detector and multiple tuner, providing for the reception of all waves between 100 and 2,500 metres. The multiple tuner is calibrated to permit of the instrument being set to any pre-arranged wave length, and further to be provided with a change switch to permit of instantaneous change of the circuit from a highly syntonised tuned condition to an untuned condition (for standing by), especially devised for picking up incoming signals of widely different wave lengths. By reason of its robust nature the magnetic detector may be employed permanently connected to the transmitting aerial, thus dispensing with all mechanical change over switching arrangements, between transmitting and receiving, and, in conjunction with the short circuiting contacts on the manipulating key, permitting the operator being interrupted in the transmission of a message in the event of erroneous reception at a corresponding station. A suitable testing buzzer is provided and permanently installed for the purpose of instantaneously testing the receiving circuits, and a tuning lamp and adjustable choke are permanently installed for the purpose of indicating the condition of syntony of the transmitting circuits, and a wave-meter, covering the full range of the transmitting circuit is supplied. A tool box containing an electrician's complete repairing kit, together with all special tools and spare parts for the different machines, is furnished.



The SS. "Olympic" on her Maiden Voyage. View showing Aerial.

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Maritime Wireless Telegraphy.

A DISPATCH was received in London, via Halifax, N.S., from a passenger on board the SS. "Olympic," which was making her first voyage across the Atlantic, stating that the ship was "surpassing the most sanguine expectations," also that "the many congratulations from passing ships keep the wireless apparatus busy all day." The message was transmitted by wireless telegraphy from the "Olympic" on Monday midnight, June 19th, and was received in London in the early hours of the following morning.

IN their desire to reach England in time to witness the celebration of the Coronation, several American visitors made their final arrangements by Marconigram. One enterprising agency having seats to dispose of on the processional route inserted an advertisement in the newspaper published on board one of the Cunard liners, and from mid-Atlantic seats were arranged for and purchased by means of Marconigram.

THE following vessels, with the exception of the "Olympic," which has a 5 K.W. set, were fitted with 1½ K.W. Marconi apparatus during the month of June:—"Caesarea" and "Sainia" for the London and South Western Railway Co.; "Ruahine" for the New Zealand Shipping Co.; "Warwickshire" and "Worcestershire" for Bibby Bros.; "Burutu" for the Elder Dempster Co.; "Arawa" for Shaw, Savill & Albion Co., and "San Guglielmo" for Pierce Bros.

The SY. "Viking," belonging to the Polytechnic Touring Association, was fitted with a 5 K.W. set.

THREE boats belonging to the Isle of Man Steam Packet Company are to be equipped with Marconi wireless apparatus.

THE BELGIAN COMPANY have completed a contract with the Compagnie Belge Maritime de Congo for the publication of a newspaper on board their vessels "Leopoldville," "Elisabethville," and "Bruxellville," trading between Antwerp and the Congo. The first issue was published on July 1st.

A MID-ATLANTIC Marconigram was recently received by Messrs. W. L. Stewart and Co., Ltd., of 26, Albemarle Street, Piccadilly, London, W., with an order for a motor car.

THE AMERICAN COMPANY have received instructions from the owners, the Munson Steamship Company, to equip the "Curityba" and "Olinda" trading between New York and Eastern Cuban ports.

THE TRINIDAD SHIPPING AND TRADING COMPANY SS. "Pegu," which is at present in course of construction, is to be fitted with a Standard 1½ K.W. Ship Set complete. The "Grenada" and "Maracas" will also probably be fitted by the American Company at New York.

THE BELGIAN COMPANY have received instructions from the Nordenfelske Company to install a Marconi set on the SS. "Haakon VII," sailing between Newcastle-on-Tyne and Trondjhem.

A STRONG movement is on foot to establish wireless connection between Hong Kong and Singapore, and the shipping and business interests are deeply interested in the plan and are anxious for its early adoption.

THE CIA NACIONAL DE TELEGRAFIA SIN HILOS (The Spanish Co.) have received a Royal Order to install Marconi apparatus on board the battleship "Carlos V."

THE BELGIAN COMPANY have received instructions from the Koninklyke Paketvaart Maatschappij to equip the "Van Cloon" and "Van Overstraten" with Marconi apparatus. These vessels are engaged in the Dutch East India trade.

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Obituary.

We regret to announce the death of Mr. W. J. Croxen, who was employed as chief clerk at Clifden. After a short illness he was obliged to undergo an operation for cancer, the effects of which unfortunately proved fatal. Mr. Croxen leaves a widow and one child. No provision having been made for them, it has been decided to open a fund on their behalf, and donations, which may be sent by members of any of the Marconi Companies, or by the public generally, will be very gratefully received and acknowledged by the Editor of *The Marconigraph*, Watergate House, Adelphi, London, W.C.

We regret to announce the death, during the month, of Mr. J. McCarthy. The deceased joined the staff of the International Marine Communication Company on April 18th, 1910. From that date to May 8th he was stationed at the Liverpool Training College, when he received an appointment on the staff of the company. He was a conscientious and attentive worker. His first voyage was made on the SS. "Inanda" of the Aberdeen Line, and afterwards he was appointed Marconi Officer in charge of the installation on the SS. "Saxon." It was on his third voyage to South Africa that he was taken ill shortly before arriving in port. On arrival he was taken to hospital, where he passed away on June 9th. Mr. McCarthy was buried in the Union Castle Cemetery in Cape Town, a special plot of land for burying members of the crews of the Union Castle line.

The death occurred recently of Mr. William Lynd, who has frequently lectured on Wireless Telegraphy, and was well known to the Marconi Companies for the past twelve or thirteen years.

Movements of Engineers.

Mr. W. G. Covell left Chelmsford for Glace Bay on June 9th.

Mr. R. G. Kindersley returned from Spain on June 26th, and now leaves for Broomfield, where he will be engaged upon special design and experimental work.

Mr. A. G. Savill, on his return from Varna, took up holiday relief at Clifden on June 12th.

Mr. R. K. Rice returned from Tavin on June 17th, and is at present engaged on ship installation work.

Mr. C. G. Rattray returned from Spezia on board the Greek battleship "Averoff" on June 10th, and immediately proceeded to Spithead for the completion of installation work.

Mr. N. G. Rackstraw sailed from Singapore on June 7th, in the SS. "Sumatra," and is due to arrive on July 15th.

Mr. P. E. Privett (from Chelmsford) left for Clifden on June 26th.

Personal.

Mr. S. Kos, who recently returned to England from South Africa, where he had been in charge of the erection of the Slangkop Station, is leaving for Borneo, where he will be in charge of the Balakapan Station, which is about to be opened. The illustration shows Mr. Kos tuning up on the SS. "Balmoral Castle," which was one of the first of the Union Castle liners to be fitted with wireless.

We are pleased to note that Mr. John Bottomley, General Manager of the Marconi Wireless Telegraph Company of America, was, on June 15th, elected President, for the ensuing year, of the New York Electrical Society.

Mr. F. E. D. Pereira has been appointed Superintendent of the Telegraph Staff at Liverpool.

A sum of £1,100 was expended on the installation of a complete transmitting and receiving wireless apparatus at Her Majesty's Theatre, Sydney, in connection with the production of the play, "Via Wireless."

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THE MARCONIGRAPH

No. 5. August, 1911. Subscription, 3/- per annum, post free. Price 2d. Post Free 3d.

Wireless in Two Hemispheres

THE contract entered into with the Italian Government for the erection of a 60-k.w. station in the vicinity of Rome, on a site selected by the Italian Admiralty, is one of considerable interest and importance. The building, masts, and material are being supplied by Marconi's Wireless Telegraph Co., Ltd., the erection of the masts being carried out through the intermediary of the Italian Agency. Six towers in iron and wood of the Coltano type are being erected, two each being 75 metres high and the remaining four each of 45 metres in height. These will support a multiple wire T aerial of a total length of 360 metres; the surface occupied by the aerial will be about 14,000 square metres. The Italian Government are erecting the building, which will contain engine, power, battery, and operating rooms, stores, waiting and staff rooms, and the necessary adjuncts. In the engine room, which will have a floor space of 32 ft. by 25 ft., there will be installed duplicate 50-b.h.p. Diesel oil engines, each driving, by means of a belt, a 30-k.w. continuous-current dynamo which were specially designed. Two 32-k.w. low-frequency inductances will be provided for regulating the frequency of the discharge circuit to the value necessary for the number of sparks adopted, and, in addition, two 32-k.w. high-tension transformers will be installed to transform the alternating current by the group of generators to the required voltage for the condensers. The receiving apparatus will consist of a valve receiver adapted to receive all words comprised between 2,650 and 6,500 metres. In addition to the valve receiver, a magnetic detector will also be furnished. The station is to test to Poldhu, and will have a normal power of 32 k.w., and overload up to 100 k.w. The exact arrangement of the plant for this overload has not yet been determined.

The Agreement entered into by Marconi's Wireless Telegraph Co., Ltd., The Marconi Wireless Telegraph Co. of Canada, Ltd., and The Marconi International Marine Communication Co., Ltd., on the one hand, and the Canadian Government on the other, marks an important stage in the commercial development of wireless telegraphy. Under this agreement the Marconi companies undertake to transmit general messages between stations on the Atlantic coast of Canada and corresponding stations on the coast of Great Britain and Ireland at not more than 10 cents per word for such messages, which is fully 60 per cent. less than the rates now charged for cablegrams across the Atlantic, the rate for the latter being 25 cents per word. This should be borne in mind by commercial and other interests on both sides of the Atlantic, who are constantly complaining of the oppressive rates charged for telegraphic communications between Great Britain and Canada. But this is not all, for not only will Press messages be transmitted at a shore-to-shore rate not exceeding five cents per word, but messages in connection with weather conditions and forecasts, tide conditions, ice, and reports on aids to navigation will be transmitted at that rate. The Montreal and Three Rivers Stations pass into the possession of the Government for a substantial consideration, and the Marconi companies undertake to maintain and operate the Government-owned wireless stations known as Cape Race, Point Rich, Belle Isle, Cape Ray, and Point Amour in Newfoundland, and Heath Point, Fame Point, Clarke City, Father Point, Harrington, Montreal, and Three Rivers, in the province of Quebec; Cape Sable, in the province of Nova Scotia; and Partridge Island in the province of New Brunswick. This contract remains in force for twenty years.

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GOVERNOR JOHN W. GRIGGS

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Governor John W. Griggs

President of the Marconi Wireless Telegraph Company of America

PERHAPS no type of the human species is so susceptible to the sweet uses of publicity as is the politician. Yet, if the truth were known, it would probably be found that even the politician is prone to shun too much publicity, in the belief that it has the effect of embarrassing and retarding rather than quickening the operation of his mind and the development of his plans. After all, it is not helpful to a man to have constantly to dress his mind to suit the public eye, and still less to undress it in public as politicians are so often forced to do.

Governor John W. Griggs has lived a long and strenuous career, and had attained positions of dizzy eminence in the practice of the law and in the public affairs of his country before turning his attention to business and lending his mature talents for the development of the Marconi interests in the United States of America. He was born sixty-two years ago in the State of New Jersey, and after a successful, if somewhat uneventful, scholastic career, he prepared himself for the legal profession, and eventually became a member of the Bar of New Jersey and New York, and of the Supreme Court of the United States. To his undoubted talents he added keen intellectual perception, untiring energy, and infinite capacity for work. It is no surprise to find, therefore, that the engrossing labours of his profession did not diminish his interest in the welfare of his country, and that he was able to find time to render excellent service to the State. When the opportunity arose Mr. Griggs was at hand to make the most of it. It is recorded in the pages of English history that great things have been done by men who made most of the occasion; men possessed of insight as well as foresight, who were gifted with the faculty of deciding how much was possible, by attempting that and not something else. That, if we may term it so, is the positive side of judgment—the facility of setting before oneself an object of attainment—which Mr. Griggs early in his public life showed himself capable of to a wonderful degree. But he was not lacking in the negative side of judgment, which we might say is to avoid making mistakes in the object set before one.

For eight years Mr. Griggs was a prominent member of the Legislature of New Jersey, and in 1895 he was chosen as Governor of that State. Henceforth known by the designation of Governor Griggs, he was to be made the recipient of still greater honour and responsibility. In 1899 he was appointed by President McKinley a member of the Cabinet, holding the portfolio of the Department of Justice as Attorney-General. He was one of the chief councillors of President McKinley during the period that comprised the Spanish war, the insurrection in the Philippines, and the Boxer rebellion in China, and while Attorney-General he argued many cases of great importance for the Government in the United States Supreme Court. In all these rôles, whether as councillor, statesman, or advocate, he displayed sagacity and sobriety of judgment, and to these natural gifts the fairy godmother added tact—a quality which perhaps flourishes somewhat sporadically.

Governor Griggs resigned the office of Attorney-General in April, 1901, in order to resume the practice of his profession. Since then he has held no public office. But it is not to be supposed that any country can forego altogether the services of a man who had shown a judicial or statesmanlike faculty of detachment that enabled him to see both sides of the question, and it is no surprise therefore that even after forsaking public life he consented to become a member of The Hague Court of International Arbitration.

He became a director of the Marconi Wireless Telegraph Company of America, and in 1905 was appointed President of that Company. Truly, he answers the poet's riddle of life:

"To know, to do, and on the tide of time
Not to drift idly like the cockle-sailor,
Whose pearly dances on the blue,
But to steer onward to some purposed haven
And make new waves with motion of our own."

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At the Royal Investiture.

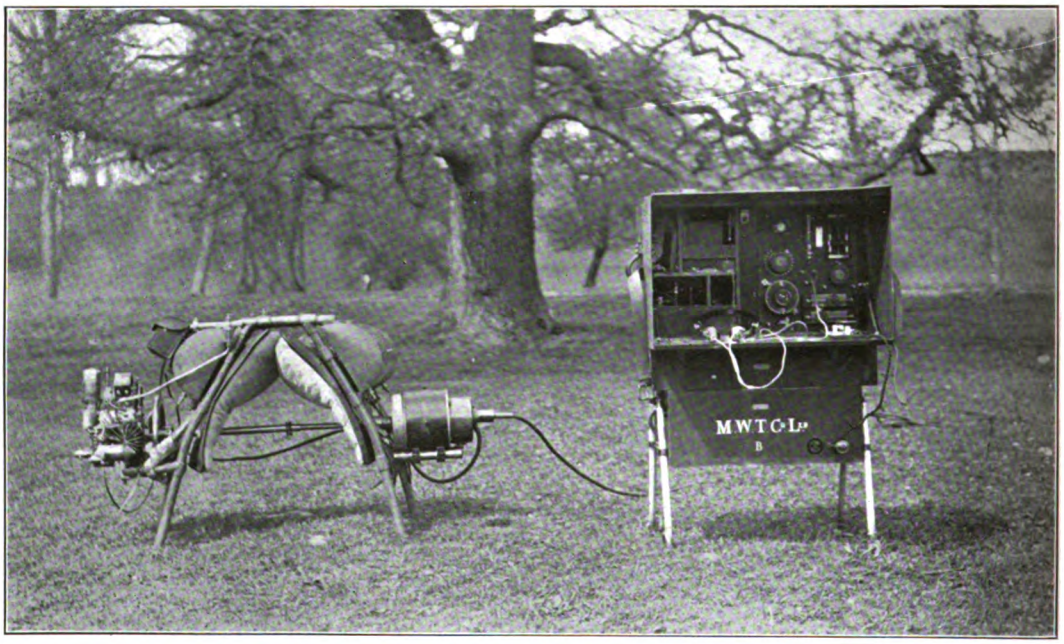
An interesting instance of the various uses to which wireless telegraphy can be put was provided by the employment of two Marconi portable wireless telegraph sets at the recent Investiture at Carnarvon of H.R.H. the Prince of Wales.

The two stations in question, which are of the Marconi's Wireless Telegraph Co.'s standard cavalry type, are the property of the Westmorland and Cumberland Yeomanry, commanded by Lieut.-Col. Claude Beddington.

The stations are similar to those recently employed on the demonstrations in Turkey and Spain, and have been specially designed by the Marconi Company to be capable of easy and rapid transport and to afford a means of communication between cavalry or other mounted units and the main body. Owing to the rapidity with which these portable sets can be erected and dismantled, the whole process lasts only a few minutes, and they are consequently of the greatest value from the military point of view. It is satisfactory to report that these sets have been spoken of in terms of the highest praise by the above-mentioned regiment, by whom they are employed regularly on all manœuvres.

The two portable stations accompanied the Westmorland and Cumberland Yeomanry to Carnarvon, to which place the regiment had been ordered for the Investiture ceremony.

One of the stations was erected in the neighbourhood of Carnarvon Castle itself, the second being situated in the vicinity of the headquarters camp, and by means of these two installations constant communication was established between the Royal yacht and the units of the fleet and the shore. Communication from the Carnarvon Castle installation was also established with the Government station at Liverpool and with the headquarters camp.



A Marconi Cavalry Pack Set, comprising Engine and Dynamo, Transmitting and Receiving Apparatus.

Constant communication was maintained between the Royal yacht and Carnarvon Castle by means of the Marconi system of wireless telegraphy. A respectful message of congratulation was sent from Poldhu by Mr. Marconi to the Prince, who graciously acknowledged this message from his yacht, also by means of wireless.

"There is big work yet to be done, and the Company intend to do that work." This statement is culled from the speech of the managing director, Mr. Godfrey C. Isaacs, at the annual meeting of Marconi's Wireless Telegraph Co., Ltd.

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Energy Losses in Condensers

In apparatus for radio-telegraphy on the spark system the oscillations are created by a discharge of a condenser, and the efficiency of the transmitting apparatus will therefore be affected by any energy losses in the condensers used. It is sometimes assumed that these energy losses are negligible, and that the chief sources of energy dissipation in the transmitter are the spark resistance and the high-frequency resistance of the circuits. This, however, is not the case, and it is necessary to provide some arrangement for the purpose of measuring the internal energy losses in condensers traversed by high-frequency currents. Such an arrangement of apparatus was described by Dr. J. A. Fleming and Mr. G. B. Dyke before a recent meeting of the Physical Society.

Dr. Fleming and his *collaborateur* have shown that these energy losses in condensers may be considered as if they were due to a resistance loss in a hypothetical resistance in series with the condenser, the condenser itself being supposed to have a perfect non-dissipative dielectric of the same dielectric constant. This hypothetical resistance is not constant, but is a function of the condenser current. The experiments were conducted by the use of a special form of impact discharger, comprising two flat plates immersed in oil, one stationary and the other revolving at a high speed. This discharger was placed in series with a primary circuit and condenser, and high-frequency oscillations were set up in the primary having any desired frequency. A secondary circuit loosely coupled consisted of a wire whose high-frequency resistance could be determined, the condenser to be examined and a hot-wire ammeter and variable resistances. The measurements consisted in observing the reading of the ammeter, and then changing the current created in the secondary circuit by a small amount by adding a known resistance which altered the decrement of the circuit, but not its inductance. From these readings an equation was obtained for the hypothetical condenser resistance. It was shown that the product of the square of the secondary current A^2 and the total resistance R of the secondary circuit was constant, and hence that the unknown condenser resistance p could be found from observations of the change in A^2 when an additional resistance r^1 was interpolated in the condenser circuit. The energy loss in the condenser was then A^2p watts. Condensers, with various dielectrics, air, oil, glass and ebonite, were examined, and the dielectric energy losses D were stated in micro watts per cubic centimetre of dielectric for given values of the electric force E. It was shown that D could be expressed as a function of E in the form $D = XE^y$, where X is a constant depending on the current density and y is a constant depending on the nature of the dielectric. For oil and air these power losses were relatively small, but for glass and ebonite large.

In the course of the experiments referred to above a large number of measurements had to be made with the cymometer of the frequency of oscillations in, and the inductance of, the secondary or condenser circuit. It was then an easy matter to draw complete resonance curves in each case and this was accordingly done with both the impact and spark ball dischargers in the primary circuit and for various resistances in the secondary circuit. The results are interesting, as showing exactly what takes place in each case in the primary circuit. If the spark ball discharger is used, and if the primary and secondary circuits are coupled with various degrees of coupling, then, for any close coupling, it was found on the resonance curve that there were three peaks corresponding respectively, as regards frequency, with the free oscillation period of the secondary and with the two-period oscillations set up by the reaction of the secondary upon the primary circuit. As the coupling was weakened the double-period oscillations died out, and only the free oscillation of the secondary survived. There was always a certain coupling, not far from 10 per cent., which gave the maximum current in the secondary circuit in the form of a free oscillation. If the secondary circuit were more highly damped, then the two-period oscillations would be more strongly marked, and the maximum free period oscillation would have a lesser maximum value.

By using an impact discharger the double-period oscillations were only apparent when the coupling exceeded about 30 per cent., and died away with a very little reduction in the coupling, leaving the predominant free secondary oscillation as the survivor. These curves showed how very quickly the primary spark was quenched when using the impact discharger. If the maximum secondary current were set up as ordinates in terms of the coupling as abscissa curves were obtained which rose up quickly to a maximum value and fell again, and which indicated that the maximum value of the secondary current was determined both by the coupling and the secondary decrements.

"By Marconi wireless telegraph through the ether Lord and Lady Kelvin send warm thanks to kind friends, electric and not electric, who made their three weeks' visit to America most interesting and delightful."—From the late Lord Kelvin, off Nantucket, on board the "Lucania," May 12, 1902.

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The New Greek Naval Marconi Station at Athens

BY F. E. WATTERSON

WHEN, three thousand years ago, King Ægeus, watching from his rocky promontory with anxious eyes for the return from Crete to Greece of the ship returning with his son Theseus from the expedition against the Minotaur, saw the melancholy black sail of death instead of the expected emblem of victory, the aged monarch threw himself into the sea in despair and perished. If King Ægeus had lived to-day he would merely have shown a little peevishness at the pilot's carelessness in forgetting to hoist the white signal; for the news of the slaughter of the Minotaur would have been received from the great Marconi station which has been completed almost under the shadow of the Acropolis at Athens.

This station, one of the most up to date in the world, stands in latitude 37deg. 58min. N., longitude 23deg. 44min. E., upon a rocky promontory, commanding superb views of ancient and modern Athens and the Attic Plain, whilst across the sparkling waters of the beautiful Bay of Phaleron lies the rugged coast of Salamis, where in 480 B.C. Xerxes watched the destruction of his fleet by the Athenian navy.

Panorama of Athens, with Mount Lykabettos in distance. Looking north from the Marconi Station.

The building is of crystalline limestone in the modern Greek style of architecture, and contains a spacious machinery hall, receiving rooms, land-line and other offices for the

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The Machinery Hall.

handling of radio-telegraphic business. There is also a library and officers' quarters, with accommodation for fifty petty officers and men, and a wireless training school. The station is in charge of Lieut. Athaniasiades, of the Greek navy.

The antennæ, which have been designed to give a maximum radiative effect in every direction, are led from a central mast, 200 ft. high, to four masts forming the corners of a square of 566 ft. Two aerials are provided, one for communications up to 1,000 miles on waves varying from 1,200 to 4,000 metres, the other for communications on 300 and 600 metre waves, in compliance with the regulations of the International Radio-telegraph Convention. Changing over from one aerial to another is accomplished instantaneously by means of an automatic switch.

Numerous engineering problems connected with the erection of the station and the installation of the apparatus had to be faced. To begin with, 5,000 tons of rock were blasted away in levelling a site for the station, and 30,000 ft. of wire were used as leads to the circle of galvanised iron plates 3 ft. below the surface which comprises the earth.

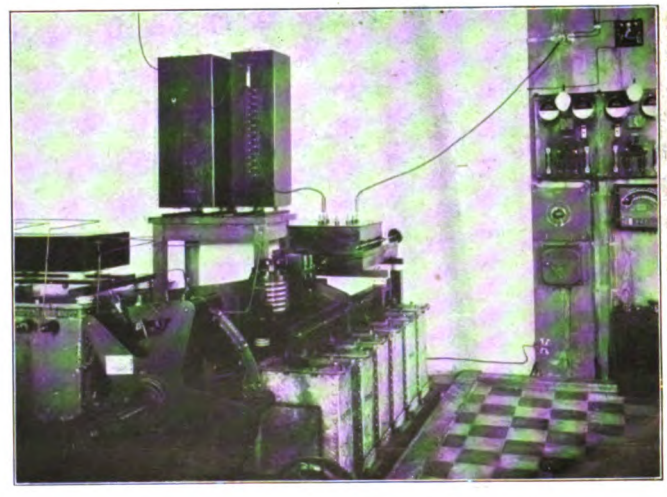
Ordinarily, current from the Piræus mains at 440 volts is supplied to the rotary converter; but for emergency purposes a 20-horse-power petroleum engine has been provided. The cases containing the parts of this engine had an eventful journey from England to Athens, for by some means they were upset into the sea at Piræus. After being fished up from the bottom of the harbour, a local contractor undertook to convey the cases to Athens, but so great was the weight of these parts that it was not until the unfortunate contractor had suffered immense damage to his transport carts that the parts were finally brought to their destination.

The power-plant consists of a 15-k.w. converter, coupled directly to a new type of rotary spark-gap, the outer electrodes of which are adjustable by a rocker to the lag and lead of the low-tension alternating current. By this means a pure musical note is given to the spark, free from undertones, in order to overcome the effects of the electrostatic discharges which prevail locally.

Adjustable couplings are, of course, provided in the oscillation transformers at this station, and as these permit of a wide range of couplings being made between the oscillating circuits, very highly defined waves can be obtained, with sharp tuning possibilities.

The condensers consist of a bank of twelve standard whole-plate units, and by means of a special commutator the capacity can be varied instantly.

Signalling is done in the generator circuit by means of a Morse manipulating key, which



The Rotary Spark Gap, Oscillating Transformer, and Inductances.

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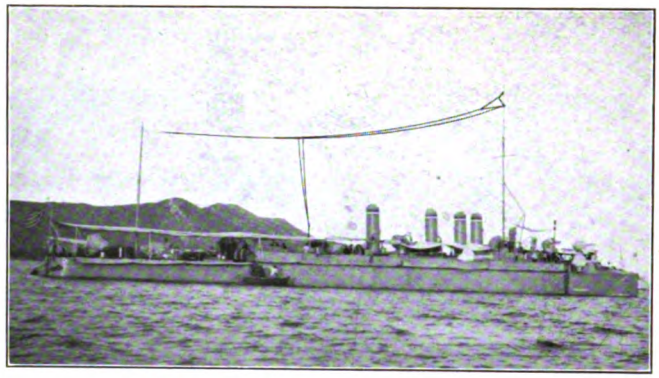
controls a high-tension magnetic switch-key placed in the secondary circuit of the transformer, the actual make and break taking place in forced draught produced by a motor-blower which quenches the arcs formed at the instant of contact and disconnection.



A Greek Destroyer. View showing the Aerial.

An important feature of the Athens installation is the means whereby the operator can be interrupted by the corresponding station whilst despatching a message. This is done by having both the receiving and transmitting instruments always connected to the aerial, through an "earth-arrester" with an automatic telephone short-circuiting device. But perhaps the chief advantage of the "earth arrester" is that it obviates the necessity of shutting down the alternator whilst receiving, thereby saving a great deal of time as well as wear and tear of the machinery occa-

View from the north-east of the Station. The Acropolis, with the Temple and Nike Apteros (the Wingless Victory) to the right.

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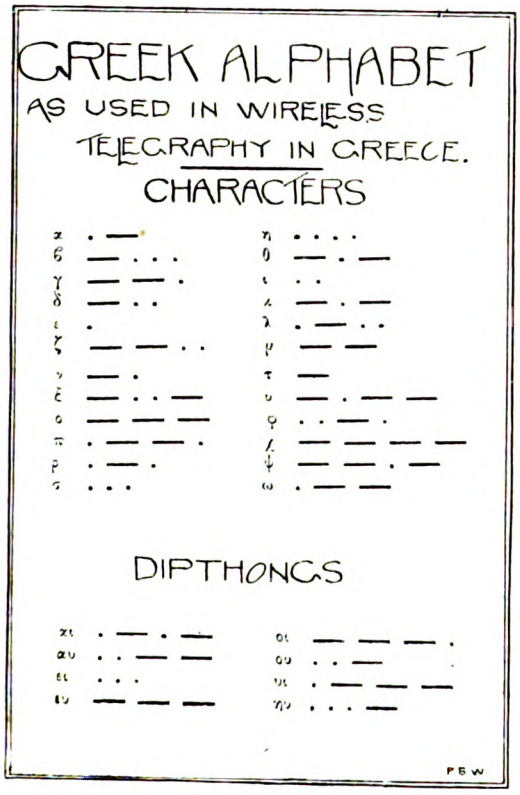


sioned by continual shutting down and starting up of the motors.

The receivers comprise the magnetic detector with multiple tuner, a filings coherer and Morse recorder being provided for stand-by purposes.

It is intended by the Greek Government that the Athens station shall handle public traffic to and from the great ocean liners which pass through the Mediterranean sea on the Orient route.

As will be seen from the above illustration, the combination of dots and dashes used to designate the Greek alphabet differs greatly from the signals of the international Morse code. Much study and long practice is required before Greek telegraphists become proficient in sending and receiving messages in Latin characters.

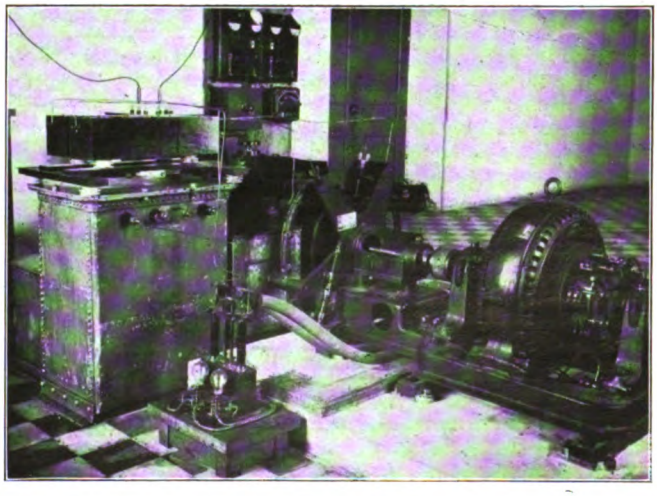
The Greek destroyer flotilla of eight units has been recently equipped with standard Marconi 1½-k.w. sets. The Royal yacht "Amphitrite" is also being fitted, whilst on board the new battleship "Georgius Overof" a 10-k.w. set of apparatus has been installed. Mr. A. B. Blinkhorn is the Company's engineer in charge at Athens, and he is assisted by Messrs. Rice and Watterson.

As a rule Marconi engineers are not much given to day-dreams, though why it is difficult to say, because is not the development of radio-telegraphy as poetic as the sweetest day-dream? But even the most matter-of-fact engineer cannot fail to be impressed by the sight of the station at Athens, which conjures up the most startling contrast of modern scientific enterprise with all that is most ancient in the history of civilisation.

The sun is setting behind the hills as I write these lines. Mount Dionysis stands out violet in the clear evening air, and the last rays of golden light falling on the Acropolis throw into relief Doric pillar and Corinthian column, and shine on pediment, architrave and entablature.

Through those marble portals have passed in solemn procession the world-conquerors of old, whose empires have vanished, whose cities are dust, Darius, Xerxes, Philip of Macedonia, Alexander the Great, Æmilius Paulus—their names echo and re-echo down the long aisle of centuries.

Now, 2,000 years after, come men from the north and speak through space to continents and islands across the sea. And the same statues of the maidens on the temple at Athena that heard the sweet songs of Sappho and the speeches of Socrates and Demosthenes and witnessed St. Paul led out in chains to die, smile down in changeless silence on the network of gleaming Marconi wires through which the spirit of Progress manifests itself to-day.



The Transmitting Apparatus, showing Rotary Spark Gap, with H.T. Signalling Key in foreground. Pipes convey the air blast to the contact.

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The Preparation of Weather Forecasts
How Wireless Aids Meteorology

MANY a light, hailed by too careless observers as a fixed star, has proved to be only a short-lived lantern at the tail of some newspaper kite. That scientific heaven which is sometimes dotted with rival glories is found to have been a stage sky merely, artificially illumined from behind; and the cynical daylight which invariably follows all theatrical enthusiasms shows up ragged holes where once were luminaries; sheer vacancy instead of lustre. It seems but yesterday that wireless was hailed as a new star in the firmament, whose brilliance attracted universal attention. But the wiseacres shook their heads incredulously and adopted the "wait and see" attitude; interested parties to whom the advent of wireless meant a very serious thing ran about with Diogenes dark-lanterns professing to see a failure but inwardly smitten with fear. Those who have waited now see achievements for which they had hoped but had not dared to expect, and although young, the history of radio-telegraphy is written imperishably on the face of the world and in characters as beneficent as they are enduring.

Of the services rendered by wireless telegraphy to various objects one of the least known, but by no means the least important, is the aid which it furnishes to meteorology. When the holiday maker is about to seek a brief relief from the toil and stress of a busy city life, or when the enthusiastic amateur gardener desires to cultivate a certain growth, his thoughts naturally turn to the weather. The forecasts and isobaric charts issued by the Meteorological Office are useful guides as to the state of the weather, despite the cynics who find that the official forecasts often go by contraries. In 1868 a series of important charts were published representing by isobaric lines the distribution of the mass of the earth's atmosphere, and by arrows the prevailing winds over the globe for the months and the year. By these charts the movements of the atmosphere and the immediate causes of these movements were for the first time approximately stated, and some knowledge was thereby attained of some of the more difficult problems of meteorology. It was shown that the prevailing winds are the simple result of the relative distribution of the mass of the earth's atmosphere: in other words, of the relative distribution of its pressure, the direction and force of the prevailing winds being simply the flow of the air from a region of higher towards a region of lower pressure, or from where there is a surplus to where there is a deficiency of air. It is on this broad and vital principle that meteorology rests.

The preparation of these charts is largely dependent upon telegraphic reports from different regions. Until the advent of wireless, however, large regions were left untouched, and instead of possessing precise data from such regions as is now available by means of Marconi wireless telegraphy, the Meteorological Department had to depend upon empirical data, which, as we all know, is entirely unsatisfactory. So important had the subject of wireless weather telegraphy become, that at the meeting of the International Meteorological Committee in Paris in 1907 it was agreed to appoint a new Commission to deal with all questions connected with weather telegraphy and especially with wireless telegraphy. One of the questions referred to this Commission was the advisability of each member urging upon his Government "the importance of national regulations for such control of wireless telegraphy as will compel each ship licensed to carry wireless instruments to take and transmit meteorological observations, also to transmit to other ships or to stations on shore all observations received."

This question formed the basis of discussion at a meeting of the Commission held in London in June, 1909, over which Dr. W. N. Shaw, the Director of the British Meteorological Department, presided. At that meeting Dr. Shaw reported that he had received a communication from the Director of the Prussian Meteorological Institute asking whether a representative of the *Reichsamt des Innern* could attend the deliberations of the Commission with respect to Wireless Telegraphy, and that a similar inquiry had been received from Dr. Polis, Director of the Meteorological Observatory at Aachen. To these replies had been sent to the effect that the Commission would doubtless be glad for the gentlemen indicated to attend the meeting at which reports respecting radio-telegraphy would be received, in order that the information at the disposal of the Commission might be as complete as possible. Dr. Polis accordingly came to London for the purpose of attending a meeting on Tuesday, June 22nd, and was invited to be present at meetings for the discussion of the subject of radio-telegraphy. Commander E. Simpson, Naval Attaché to the American Em-

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bassy in London, was also invited to attend the meeting on June 22nd, to give information about arrangements for radio-telegraphy on the American coasts.

Dr. Shaw reported upon some experiments on the transmission of wireless telegrams from the ships of H.M. Navy which commenced on January 23rd, 1907. The experiments were conducted under very favourable circumstances, and were found to give very satisfactory results, both as to the distance of transmission and the accuracy of the observations. Reports to the British Meteorological Committee on the service for the months of February and March were read, from which it appeared that out of 469 messages received in February 4·5 per cent. arrived within two hours, 16·4 per cent. within 24 hours, 20·5 per cent. within two days, and 58·6 after two days. The corresponding figures for March were, out of 672 messages, 4·7, 18·0, 24·0, and 53·3 per cent. respectively. Finally, the following resolutions were agreed to :—

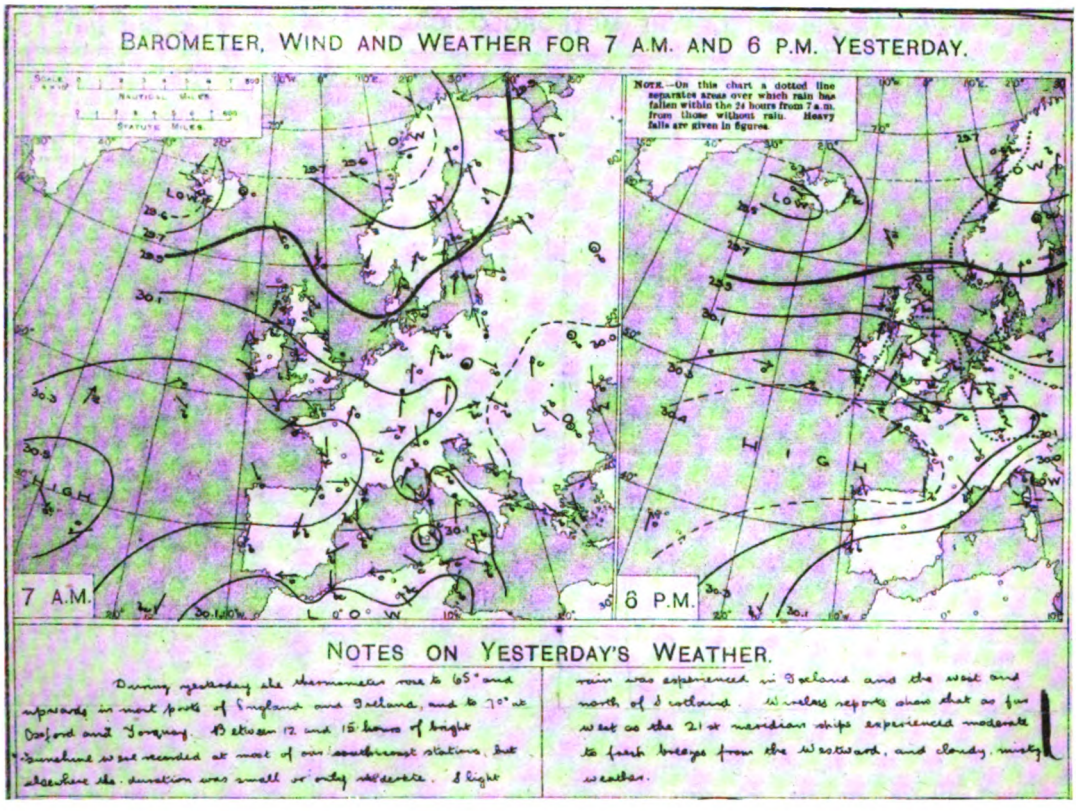
That the work done by the German and the British Offices in inaugurating a system of wireless observations at sea has accomplished results that merit favourable consideration.

In view of the test made by those Offices, and earlier by the United States Weather Bureau, the Commission is of the opinion that the transmission of reports by radio-telegraphy for meteorological purposes from ships must still be regarded as being in the experimental stage.

If an estimate of the ultimate value of the wireless reports for forecasting had to be based upon the immediate utility of the reports received in the tests conducted up to the present time, it would be difficult to present a strong case. But in view of the fact that in individual cases wireless telegraphy might prove of great importance, and that the efficiency and promptitude of the service may be expected gradually to improve, the Commission would urge further trial of the service, and looks forward with satisfaction to a renewal of the experiment by the German and British Offices in the current year.

The experiment continued, and a record of their subsequent success appears with convincing clearness in the annual reports of the Director of Meteorology in other publications. Reports of daily observations at 7 a.m. and 6 p.m. have been transmitted by wireless telegraphy for three years. These records are much valued, and are placed on the working charts with the same confidence as are those from land stations.

Much more could be written concerning the historical development of the application of wireless to meteorology, but we have said enough to demonstrate the wonderful progress recorded. It now remains to examine results,



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and this we can best do by taking the year ended March 31st, 1911.

We find during that period 89 wireless messages were sent by ships of H.M. Navy; 32 other messages were delivered in time to be included in the issue of the Meteorological Office daily weather report for the same day. In the course of the twelve months ending with March of this year, 3,955 wireless reports were sent from Atlantic liners. The numbers in the several months ranged from 404 in May to 214 in December and January. The number of messages is somewhat lower than the corresponding figure for the twelve months ending March, 1910, viz., 4,388. This is to some extent due to the fact that in the middle of May, 1909, onwards, messages which reached the shore receiving stations more than 48 hours after the hour of observing were sent on to the Meteorological Office by post. Only 3·4 per cent. of the messages reached the office in time to be included in "to-day's" map of the Daily Weather Report—*i.e.*, within four hours of the time of taking the morning observations; 39 per cent. of the messages reached the office in time to be included in one of the two maps for "yesterday" shown in the Daily Weather Report (see illustration on p. 11).

It is possible to cite a number of occasions on which the wireless messages were of great assistance to the forecaster. Thus, on January 28th, a message which came to hand about noon showed that at 7 a.m. on that day a deep depression was in existence at some distance to the west of Ireland. Storm warnings were issued immediately to the west coast of Ireland, and in the course of the evening or night strong gales were experienced there. Again, on the evening of Sunday, March 5th, two wireless messages were received as the forecasts were being drawn up. This revealed very clearly the V-shaped character of the depression then lying off the western coast of Britain which was not evident from observations at land stations. The forecasts for all western districts were notified in consequence, and proved to be accurate.

The wireless messages have also been of great service in connection with the issue of the modifications of spells of settled weather. In this connection messages which take a considerable time in transmission may still be of use if they show that there was no serious disturbance in existence over the Atlantic at the time when the observation was taken.

A word remains to be said now as to the means which produce such valuable results. Arrangements have been made for radio telegraph messages to be transmitted from 74 ships in the Atlantic. The hours of observation are 7 a.m. and 6 p.m. The observations to be signalled are: (1) The reading of the barometer at a fixed hour to the hundredth of an inch; (2) the wind direction and force at the fixed hour; (3) The fixed hour, and the state of the weather at the fixed hour; (4) the reading of the barometer, wind direction and force three hours before the fixed hour of observation. So long as the ship is between longitude 10° W. and longitude 30° W. a message should be sent regularly, (1) at 7h. 5m. a.m. G.M.T. reporting the observations at 7 a.m. G.M.T. with the control observations of 4 a.m.; and (2) at 6h. 5m. p.m. G.M.T. reporting observations at 6 p.m. G.M.T. with the control observations of 3 p.m.

The Marconi Company have arranged for the transmission from ship to ship of the messages sent when a ship is outside her own range from the shore station. If communication with shore has not been established within 48 hours of the time of observation, the messages will be forwarded by mail and not by telegraph. When the ship is between longitude 10° W. and 15° W. a message should be sent reporting observations at 1 p.m. with control observations at 10 a.m., if the position of the morning or evening observations be unfavourable on account of being beyond range of the shore station.

The following is an example of the information compiled for the message reporting an observation at 7 a.m. G.M.T., the control observation having been made at 4 a.m. G.M.T. :—

Address	Day of the Month	Position at 4 a.m.	Barometer at 4 a.m.	Wind direction and force at 4 a.m.
Meteorology	31	Long. 15° W. Lat. 51° N.	30·02	S.W. 6
Coded as, Meteorology	31351		00257	

Position at 7 a.m.	Fixed hour of Observation	Weather at 7 a.m.	Barometer at 7 a.m.	Wind direction and force at 7 a.m.
Long. 16 W., Lat. 51° N.	7 a.m.	Overcast	29·97	S. 7
	36174		99745	

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Wireless Telegraphy and Aeroplanes

THE applications of wireless telegraphy are now so widespread that much progress has been made in directions which, in the ordinary way, receive but little public recognition. One of these applications is in telegraphing from aeroplanes and airships. The advantage of being able to communicate with land or other stations was well exemplified in the case of the Wellman flight, and the gain to a military aeroplane scout in being able to send messages to his army is obvious. With the aeroplane the weight of the apparatus is important. A long aerial wire, though a necessity where distances of any length have to be covered, is almost out of the question. Many experiments have been conducted with long aerial wires trailing behind an aeroplane, and distances of a few miles have been covered by that means. In a recent issue of *The Marconigraph* reference was made to experiments carried out with Mr. McCurdy's aeroplane in the United States, and in that case only one long wire was employed, the steel wires of the machine itself being used as a counter-capacity. The idea of employing the network of wires on the aeroplane is, however, impracticable, as they become "alive," and might give serious shocks to the pilot or passenger. Two long wires appear to be the simplest solution of the problem, but trailing wires present dangers in so many ways to a machine travelling at a high speed through the air that pilots might rarely consent to their use.

Mr. Robert Loraine (the Actor-Aviator), who carried out some Wireless Experiments on an Aeroplane in conjunction with Mr. Thorne Baker.

The Early Work.

In a lecture before the Royal Institution, Mr. T. Thorne Baker passed in review some of the work already accomplished in the application of wireless telegraphy to aerial navigation and referred to some satisfactory results obtained by Mr. Farman by using two trailing aerials, each consisting of rather thin wire about one hundred metres in length. Those experiments were carried out some time after Mr. Baker had adapted a similar arrangement to a Bristol biplane in this country. In the latter case no loose wires were used, and thus he had been limited to the amount of aerial that could be attached to the machine itself—about 50 ft. Instead, however, of using balanced aerials, he coupled them to each end of an inductance coil, and increased their effective length to the greatest extent possible without sacrificing efficiency. In the latest form of the apparatus he was using a 6-in. induction coil with a $\frac{5}{8}$-in. spark gap, fixed at a considerable distance from the apparatus, so as to be away from the petrol tank. Two light brass rods extended from the coil well into the space between the two main planes of the machine, and to one side of the tank, and two $\frac{3}{8}$-in. brass rods sliding over these and $\frac{5}{8}$-in. apart formed the spark gap terminals. Shunted across the spark gap was a condenser of the Leyden jar type, and an inductance coil consisting of seven turns of No. 14 copper wire wound on a light ebonite drum. This in-

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ductance had sliding contacts so that the number of turns used could be varied in the usual manner, in order to tune the two circuits. The two aerial wires were connected to the two ends of the inductance in use, and the aerial circuit was brought into tune with the shunt circuit. A secondary battery of eight or ten volts supplied the primary energy, about 50 or 60 watts being required.

Two new arrangements have since been adopted, which should greatly enhance the efficiency of the plant. The chief of these is a long light brass tube attached to, but insulated from, one side of the tail of the aeroplane. This acts as a counter capacity, or "earth," to a long aerial wire on the other side. This aerial starts from the nose of the machine, is carried thence to the extreme outer edge of the main plane, thence back to the tail, and thence to a loose extension, a length of 60 ft. of copper wire trailing behind.

Aeroplane Scouts.

Much attention has been given to the problem of receiving wireless messages on aeroplanes. For an aeroplane scout to be able to communicate with his commanding officer is, of course, of primary importance, but it would be of immense advantage if he could exchange messages or receive commands. The chief difficulty is that of noise. A visible method of receiving must perforce be selected. Mr. Baker suggests an arrangement in which a coherer is fitted up to the aerials, with a tuning condenser shunted across it, and every two seconds the coherer is automatically decohered by a striker actuated by a magnet excited by a clockwork contact maker. A relay and battery are connected in series with the coherer, and the local circuit of the relay is connected with another battery and electric lamp. Each time a signal is received the lamp lighted up—for one second in the case of a dot and for two seconds in that of a dash. These long signals are obviously necessary, but in spite of that a message can be sent with reasonable rapidity.

An alternative means of receiving on an aeroplane is to use an inker, and this method again requires the employment of the coherer. The inking apparatus is heavy, however, and requires fairly careful adjustment, so that it is rather unsuitable for use where there is much vibration. The question of vibration is a serious one with the ordinary coherer, for if mechanical decohesion is very rapid, it might be impossible to make the coherer work long enough to get the local side of the relay to work effectively. The actual number of impulses per second in an aeroplane travelling 30 miles per hour, with a Gnome 7-cylinder engine, is on the average too great for the coherer to act. In that case it becomes necessary to employ an anti-vibration holder to take off the abruptness of the shock, or a coherer which is insensitive to the abruptness of the shock.

Telegraphing from Balloons.

Wireless telegraphy from balloons and airships has reached a more satisfactory stage. Of first importance is the ability to suspend a long wire from the balloon, and next the weight-carrying capacity of the balloon itself. The apparatus used in the Beta military airship weighed roughly 100 lbs. and signals had been transmitted, under favourable conditions, a distance of about 50 miles, so that the ratio of weight to distance of transmission was roughly 2 lbs. to the mile. An ordinary induction coil and accumulator had so far been used in the experiments and one trailing aerial wire and a counter-capacity. In the counter-capacity what was required was superficial area to take the electrical charge, and hence as light a substance as possible might be chosen.

The form of the future wireless outfit for airships would, Mr. Baker suggested, consist of a two-cylinder petrol engine coupled directly to an alternating current generator, the output of the latter being about 2 k.w., an aerial wire about 350 ft. in length, and a counter-capacity in the form of very thin metallic sheeting suitably disposed. Either a transformer for producing the high tension current and a zinc spark-gap or an arc transmitter would be employed.

Attention has been directed during the last few months to the production of portable apparatus. The chief limiting factor in small receivers is in connection with the detector. The vacuum valve detector of Professor J. A. Fleming will probably be the most suitable in many respects, and next to that an electrolytic detector.

A pathetic example of a new development in the use of wireless telegraphy as a consoler and helper is telegraphed from New York. It is stated that a well-known millionaire, who was travelling under an assumed name, attempted to commit suicide on board the French Transatlantic liner "La Lorraine." Ill-health is given as the reason for the attempt. His son, who was on board the "Kaiserin Auguste Victoria," communicated with his father by wireless telegraphy in affectionate messages, pleading with him and consoling him in his depression. The report does not state whether the plea was successful, but while hoping that the curative effects of wireless will not be neglected by persons suffering from depression, we cannot recommend suicide or attempted suicide as a means of giving prominence to this new phase of wireless.

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Freak Communications

The Scottish National bard who assured us, with that unerring accuracy which is sometimes the unconscious product of the poetic instinct, that

"The best laid schemes o' mice and men
Gang aft a-gley,"

uttered a sentiment which all who are engaged in scientific investigation or in the application of scientific principles will endorse with fervent sadness. Who has not read in one of Mr. H. G. Wells's scientific romances of the absent-minded inventor who, desirous of exploring the lunar regions, set to work upon the production of a substance that would gravitate towards the moon? The premature birth of this substance, however, had effects which were entirely unforeseen and which just escaped depopulating the terrestrial globe and causing other grave inconveniences. To cite examples of "freak" occurrences that are experienced in every-day life would require more space than is available for a single article.

Wireless "freak" communications are wrapped up in the phenomenon of variations in the transmitting efficiency of the atmosphere. Perturbances in this respect exhibit almost the same characteristics of irregularity as atmospheric impulses. Freak ranges of communication or variations in range of communication occasionally occur by day, but are not (in the case of comparatively short-range coast stations) then of a pronounced character. The variations noticed during the night hours are more pronounced. The sudden veiling or obscuring of distant signals, together with the equally sudden "opening out" of signals observed whilst listening on the receiver at a wireless station during the prevalence of this phenomenon, is very impressive. These variations of range are not found to synchronise definitely with the periods of atmospheric disturbances, though it may well be that more disturbances are observed when the range extends. Communications taking place at ranges of less than 100 or 200 miles appear to be rarely, if ever, influenced by this phenomenon in these latitudes.

It appears probable that the phenomenon is closely connected with changes of an electrical nature occurring in the upper regions of the atmosphere, and as a possible though speculative clue, it may be suggested that the effective receiving range of a station is determined not so much by the height of its aerial system as by the height from which it will experience inductive influence, or in other words, the height to which the lines of electric strain emanating from the aerial under the influence of the atmospheric potential gradient will persist.

Diary of Events.

[Under this heading we give a monthly record of the progress of Marconi wireless telegraphy. Apart from the general and historical interest which attaches to such a compilation, we have reason to believe, from the number of inquiries that constantly reach us, that it will be of much service to lecturers, tutors and others who may be professionally interested in the subject. Appended are some notable events that have occurred in August of preceding years.]

1899.

August 27th.—Communications passed, by means of Marconi apparatus installed at the Dover Town Hall and at Wimereux in France, between the meetings of the British Association at Dover and the Association française pour l'Avancement de Science at Boulogne.

1901.

August 8th.—Agreement signed for reporting of international yacht races in the next two months between the "Columbia" and "Shamrock II."

August 16th.—Nantucket Wireless Station commenced working commercially.

1902.

August 30th.—Messages from Poldhu received on the Italian battleship "Carlo Alberto" at Ferrol.

1903.

August 22nd.—Mr. Marconi left Liverpool on SS. "Lucania" and conducted experiments in long-distance telegraphy throughout the voyage. News messages received and published on board the "Lucania" from Cape Breton Station shortly after leaving the British coast.

1904.

August 4th.—Public wireless service between Bari and Antivari inaugurated.

August 11th.—British postal authorities undertook to grant to Marconi's Wireless Telegraph Co., for a period of fifteen years, facilities for handling long-distance messages, and for eight years to grant to the Company licences for ship and shore communication, and further to grant to the Company the right to charge an additional rate not exceeding the rate allocated to shore stations for every message interchanged with systems other than the Marconi.

1906.

August 4th.—La Compañia de Telegrafia Sin Hilos del Rio de la Plata formed to acquire and work the Marconi patents and rights in Argentina and Uruguay.

1907.

August 17th.—Agreement made with the Lloyd Italiano for the equipment of its vessels.

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The Editor will be pleased to receive contributions; and Illustrated Articles will be particularly welcomed. All such as are accepted will be paid for.

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Morocco Bound.

Recent events in Morocco have attracted world-wide attention. With the political aspect of the situation this journal has no concern, and in the ordinary way the arrival of the German gunboat “Panther” at Agadir and its subsequent replacement by a German cruiser would have passed unnoticed. Whatever differences of opinion there may exist concerning the action of the German Government in substituting a cruiser for a gunboat, there is surely no one who will deny that, from the German point of view, there was much wisdom, if not ingenuity, in the explanation given in some of the newspapers of the Fatherland, that the change was brought about by the desire of the Government to have a vessel in the Moroccan waters fitted with an equipment for wireless telegraphy. This incident brings home most forcibly the remarkable importance of wireless telegraphy in naval affairs. That the question has long since passed the stage when any doubt can exist as to the utility of wireless it is only necessary to refer to the activity of the British naval authorities in the matter, and, judging from the amount of public interest therein, it requires no great prophetic vision to predict that in future the question of wireless will loom more largely in the parliamentary discussions on the Naval Estimates than it has done in the past.

The Conquest of the Air.

The article which appears on page 13 of this issue, and in which developments in the application of radio-telegraphy to aeronautics are described, deserves more than passing attention. It shows with unmistakable clearness how easily the progress in wireless adapts itself to advances made in the realms of science, engineering and practical everyday affairs. No less significant and important are the services which wireless is able to render to meteorology. Areas which formerly were beyond reach have now been brought within easy reach of London, thus furnishing the meteorological department of Great Britain with accurate information upon which to base the weather reports, instead of the empirical data that the department had at one time to rely upon. Radio-telegraphy is an art as well as a science, and both are progressing. The splendid services already rendered by the Marconi system to aviation and to meteorology are at once a proof of present perfection and an evidence that the arduous labours of its inventor have borne fruit in yet larger power than was dreamt of to command the forces of Nature for the use and benefit of mankind.

The Factor of Safety.

The German Government have under consideration the question how far the compulsory introduction of wireless telegraph installations is desirable in the interest of the navigation of merchant vessels, and especially for the safety of the passengers and crews. A conference on the subject took place recently in Berlin in the presence of representatives of the Government and of the shipping interests, the idea in the first place being an amplification of the regulations for the prevention of accidents to the seafaring profession.

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Company News

Marconi's Wireless Telegraph Co., Ltd.

An event of the past month has been the fourteenth annual meeting of Marconi's Wireless Telegraph Co., Ltd., which was held in London on July 20th. The report and balance-sheet for the year ended December 31st, 1910, showed that during the period under review the business of the Company has made considerable extension, the gross trading profit for the year having amounted to £127,452 13s. 1d. and the net profit carried to balance-sheet £60,513 0s. 3d.

In the early part of the year the directors resolved that it was time there should be an end to the infringements of the Company's patents. An action was accordingly commenced against one of the infringing companies, resulting in a declaration of the validity of the Company's Patent No. 7,777. This patent is of paramount importance, embracing syntonisation, and with it dated the real practical commercial utility of wireless telegraphy. The directors are advised and believe that no wireless station of any practical utility can be erected without infringing this patent. It will be the policy of the directors to maintain the shareholders' rights both at home and abroad. As a result of this action substantial benefit accrues to the Company in the form of compensation and in other ways. Reference was made in the report to the large sums of money which in the past have been expended by the Company in experimenting and developing long-distance wireless telegraphy, and the hope expressed that these will be well rewarded. The Company alone have succeeded in erecting long-distance stations able to conduct day and night commercial wireless telegraph service. The future policy of the Company lies mainly in this direction, and negotiations of an important nature are pending to erect and work, or be interested in the working, of a chain of wireless telegraph stations around the world.

The Belgian Co. have declared and paid dividends for the year ending December, 1910, amounting to 50 francs per Capital Share (10 per cent.) and 24 francs per Founder Share. The French Co. have declared and paid a dividend for the past year at the rate of 5 per cent. per annum. The Marconi International Marine Communication Co., Ltd., whose business also is growing extensively, have declared for the year ending December 31st, 1910, a first dividend at the rate of 5 per cent. The balance-sheet shows that this Company owns 200,182 fully-paid shares in that Company of a total capital issued of 204,056 shares.

Owing to the strenuous competition and other circumstances which obtained in Germany, an agreement has been entered into by the Belgian Co., with this Company's consent and approval, under which all the mercantile vessels in Germany flying the German flag, fitted with either the Telefunken or Marconi system, were transferred to a new company entitled the Deutsche Betriebsgesellschaft für Drahtlose Telegraphie m.b.H. Neither this Company nor the Telefunken Co. will in future fit any mercantile vessels flying the German flag; this business will be carried on exclusively by the new company, who now hold the licences from both the Telefunken and Marconi Companies for this purpose; the system installed will be known as the "Debeg." The arrangement embraces the German mercantile marine only. The Belgian and the Telefunken Companies hold the shares of the "Debeg" Company, and the Board is composed of members of those two companies. and include Commendatore Guglielmo Marconi and Mr. Godfrey C. Isaacs. The Company's business generally continues to show substantial increase, and the directors recommended the payment of the cumulative 7 per cent. dividend upon the Preference Shares to the end of December, 1910, which will absorb the sum of £16,599 13s. 2d. There will thus remain to the credit of profit and loss account the sum of £49,119 4s. 8d., which will allow of, and the directors will recommend, the declaration of a dividend upon the Ordinary Shares. Subject to the approval by the general meeting of the payment of dividend upon the Preference Shares above recommended, it is the intention of the directors to immediately declare an interim dividend upon the Preference Shares for the half-year ending June 30th last at the rate of 7 per cent. per annum.

Since the last general meeting, Commendatore Guglielmo Marconi has resigned his position as Joint Managing Director of the Company, and Mr. Godfrey C. Isaacs was appointed sole Managing Director. The death of Sir Charles Euan Smith left a vacancy on the Board. Mr. Hammersley Heenan retires by rotation, but his business occupations at a distance from London do not allow of his devoting such time to the Company's business as he would desire; he therefore does not offer himself for re-election. Colonel Albert Thys and M. Maurice Travailleur, for years intimately associated with the Company's business, have been elected members of the Board.

In moving the adoption of the above report, Commendatore G. Marconi, who presided, said that the transatlantic service, which was opened in April last year, continued to work very satisfactorily, particularly in so far as the wireless operation of the service was concerned. They had, and continued to have, some trouble owing to the mutilation of code words by the land lines, which applied more to this country than to the

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other side. They had arrangements in view which should eliminate this trouble; their programme, however, must be subject to circumstances. A satisfactory solution would be the continuance of their wireless service in London, provided the necessary licence could be obtained from the Post Office. In view, however, of the Government programme in connection with wireless telegraphy, this question must stand in abeyance for the present. The difficulty to which they had referred did not arise with plain English messages; these the Post Office operators seemed able to handle very efficiently.

Probable Reduction in Rates.

It was therefore probable, subject to negotiations pending, that at an early date they would carry into effect their intention of accepting plain English messages at the rate of 4d. per word. By adopting this course a great many messages now sent by code at the higher rate would be sent in plain English, and they would be at 4d. per word just as profitable, and certainly more satisfactorily handled than code at 7½d. He was engaged in making the necessary arrangements at the Clifden station for the introduction of their new duplex system, and so soon as these arrangements may be completed, and in the very early future, he was proposing to proceed to Canada similarly to instal their Glace Bay station. When this was done their service would be materially improved, and its capacity at least doubled with a very small increase in running expenses. Amongst the large amount of work completed during the past year was the construction of two stations in Brazil for the Madeira Memore Railway Company, thus putting Porto Velho into radio-telegraphic communication with Manaos. Notwithstanding the tropical climate, these stations, 600 miles apart, were giving every satisfaction, and a daily newspaper was published in Porto Velho entirely dependent for its news upon the wireless telegraph service. He made particular mention of these stations as an indication of the probable adoption of wireless telegraphy in undeveloped countries for the commercial telegraph service of the future, in place of land lines.

Military Apparatus.

They had designed several types of portable apparatus for military purposes, and business of a substantial nature was resulting therefrom. During the early part of the year they submitted to His Majesty's Government a scheme to put all the British possessions into wireless communication with each other, and applied for a concession for the erection and working of the necessary stations. From this would appear to have developed the imperial wireless scheme introduced by Sir Joseph Ward at the recent Imperial Conference. They would have preferred to have carried out the scheme as they had themselves proposed. There were, however, reasons which they were quite able to appreciate why the Government should prefer to take this scheme in hand themselves under a working arrangement with that company. They would, however, be equally satisfied if their negotiations eventually resulted in their erecting the stations on behalf of the Government upon terms which would compensate the Company for the large sums of money and the immense amount of work which it had devoted to the development of long distance commercial wireless telegraphy. They were satisfied that the Government recognised it was solely due to that Company's patents and to the experience and knowledge which it had obtained through its work in connection with its commercial operation of the transatlantic service that the imperial scheme had come within practical politics. They were engaged in active negotiations with foreign Governments for the erection of other long distance wireless telegraph stations in countries outside the British Empire, which stations would either be worked by them or they would remain interested in the working of them. The policy of the Board was to erect long distance commercial wireless telegraph stations throughout the world and to remain interested in the working of them. The judgment obtained against the British Radio-Telegraph and Telephone Company had materially strengthened the position of their Company.

The Board had decided to declare an interim dividend upon the Ordinary Shares for the six months ending June 30th, 1911, at the rate of 10 per cent. per annum.

Mr. Godfrey C. Isaacs, who seconded the adoption of the report, said there was big work yet to be done, and the Company intended to do that work. The Canadian Company were making excellent progress, and the atmosphere being now clear, it was more than probable that when the next meeting was held they would be able to announce that the Canadian Co.'s indebtedness had been satisfied. The shares of the Company were now officially quoted on the Bourses of Rome, Genoa, and Amsterdam, and to these Paris and Brussels will probably be added very shortly.

The Share Market

The publication of the report of Marconi's Wireless Telegraph Co., Ltd., was awaited with much eagerness, and much curiosity was displayed as to the amount of the dividend which would be declared on the Ordinary shares. The Company's shares have been very active during the past month, dealings having actually taken place at 50s. The making-up prices on July 26th were :

Ordinary	42s.
Preference	40s.

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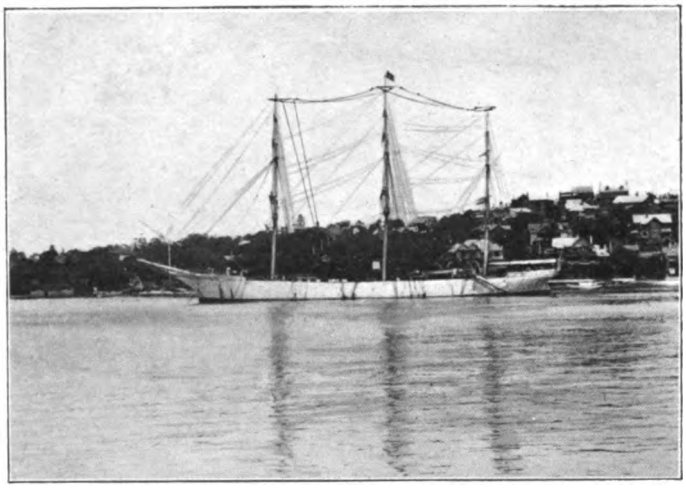
Wireless on a Sailing Vessel
The Cadet Ship "Mersey"

By Lieut. FREDERICK CROSS

THE cadet ship "Mersey," in which the White Star Line are training 60 cadets for their service, recently arrived at the London Docks on the completion of her third voyage round the world. She is under the command of Lieutenant F. W. Corner, R.N.R. The "Mersey" visited Adelaide, Melbourne, and Sydney, and returned home laden with wool, iron rails, and tallow. The homeward voyage was accomplished in 104 days. On the voyage from Melbourne to Sydney, in January last, the "Mersey" was much delayed by severe gales. She took shelter from the heavy seas among the islands of the Bass Straits, and was confined to these narrow waters for several days. About 20 of the cadets, who had previously served for two years on board the "Worcester" and the "Conway," have completed their training and will now sit for their second mate's certificate.



The Wireless Aerials on the Cadet Ship "Mersey."

The "Mersey" carried for the first time on this voyage an installation of wireless telegraphy. By its means she was able to keep in constant communication with passing vessels while sheltering in the Bass Straits. On the homeward voyage she communicated with wireless stations on the coast of Brazil and at the Azores, and for the last week she has been supplied daily with news from home. In spite of the rumours that an American schooner was fitted with "wireless," there is no denying that the "Mersey" is the first properly fitted "wireless" sailing ship, and it can claim to be the first sailing ship to report by wireless at stations like FNR and FLO, also the English coast stations.

The "Mersey" was fitted, in July, 1910, with the double coil set suitable for transmission by means of current supplied by accumulators, the receiving apparatus being the standard Marconi magnetic detector and multiple tuner. The apparatus was under the care and working of Lieutenant Frederick Cross, R.N.R., the Instructor on board. Owing to anticipated difficulties in maintaining the aerial between the mast heads of a sailing ship, it was decided to place only a small aerial about 80 ft. in height. This installation and arrangement, in the hands of an experienced operator, would have given approximately a range of 50 miles, but owing to inexperience only short distances were bridged in communication. Nevertheless, it must be considered exceedingly satisfactory, when taking into consideration the entire absence of experience with wireless on the part of person operating, that the apparatus should have worked for eleven months without a single break down. After being at sea for some time it was decided to fix the aerial at the mast heads, and a very great improvement resulted, communication being maintained over 185 miles and during the night hours over 300 miles.

Some of the experiences on board were rather amusing. When the vessel left Liverpool no one on board knew much about wireless telegraphy, and as day after day passed without any calls being made we became a little suspicious of the apparatus, after the fashion, I suppose, of the inexperienced workman who blames his tools for faulty work. However, the officer on deck was instructed to scan the

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horizon carefully for approaching "aerials." One day there was great excitement on board when the "Amazon" was sighted. We hoisted the International Code Flag Signal, "Please stand by; wish to communicate by wireless." Doubtless this strange proceeding on our part must have surprised the officers of the "Amazon," who, however, called us up and exchanged communications with us. Flushed by our initial success we continued on our sail, but to our dismay we exchanged no further messages, and again turned suspiciously to our apparatus. Upon our arrival in the port of Adelaide we anchored half-a-mile from the "Suevic," from whom we learned that our communications were too faint to be understood. That determined us to fix the aerial at the mast heads, as mentioned above, and by the time we reached Melbourne everything was working splendidly. Whilst at Melbourne we forwarded a telegram for the "Runic," lying off the Straits, and whilst waiting at Queenscliffe for a fair wind forwarded to the "Mantua" a communication from her agents.

Our experience with the Marconi equipment was most satisfactory, and should go far to encourage owners of sailing vessels to furnish their boats with similar equipments.

Progress at Land Stations

A CORRESPONDENT at Las Palmas sends us two photographs of the Melenara Station, which is now being erected by La Compania Nacional de Telegrafia sin Holos. We hope to give a full description of this interesting station in a future issue, but in the meantime the accompanying illustrations will serve to indicate the general lay-out of the buildings. Fig. 1 shows a front view of the Melenara Station, which comprises (reading from left to right) an engine-room, an accumulator room, a land-line office, an operating room and house. Fig. 2 shows the long and short aerials leading into the station.

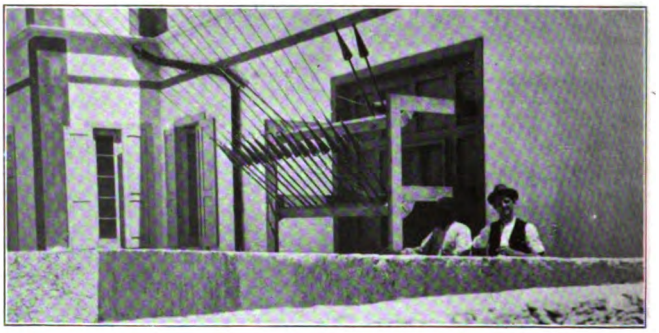

Fig. 2. Aerials in Melenara Station.

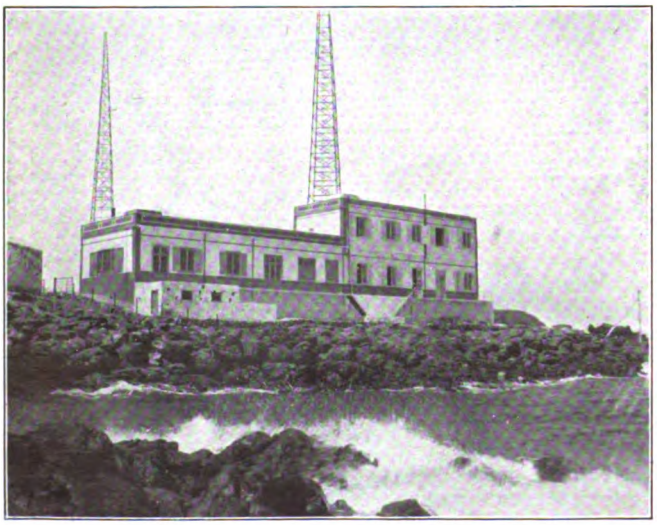

Fig. 1. The Melenara Station at Las Palmas.

The Italian Government wireless station at Becco di Vela has been closed, and a new station at Taranto, with a range of 500 kilometres, was opened to public service on May 15th. The Government wireless stations at Capo Mele and Capo Sperone are now opened day and night for public service.

The Italian Government has established a coast station tax of 30 centimes per word on all radiotelegrams exchanged between its coast stations and ships at sea. The total wireless rate will thus be 7d. per word, and to this will be added the usual forwarding charges from the coast station to destination.

A twenty-year contract has been completed between the Marconi Wireless Telegraph Company of Canada, Limited, and the Canadian Government, for the operation of the latter's coast stations in Eastern Canada, including the stations in the Gulf and River St. Lawrence.

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Book Notice

"A Handbook of Wireless Telegraphy," by James Erskine-Murray, D.Sc. Third Edition, 1911. (Crosby Lockwood and Son: 10s. 6d.)

Dr. Erskine-Murray is to be congratulated upon the third edition of his book. When it is remembered that the book made its first appearance in 1907, and was thoroughly revised in 1909, it will be realised how rapidly wireless telegraphy is advancing. Dr. Erskine-Murray has no intention of allowing his book to become out of date, and the present edition reveals an unsparing revision both by the addition of new matter and the deletion of obsolete portions.

For the greater part of the book we have nothing but praise. The earlier chapters are devoted to the history of wireless telegraphy and to the development of apparatus for the generation and detection of Hertzian waves. Then follow chapters on the various "systems" of wireless telegraphy, which are particularly interesting on account of the author's wide experience and practical knowledge of most of the apparatus he describes. Next come two very interesting chapters (XVI. and XVII.), entitled "Some Points in the Theory of Jigs and Jiggers" and "On Theories of Transmission" respectively, which contain much of the author's original work, besides all the information to be obtained from other sources. Of Chapter XVIII. on Tesla's "World-Wave Telegraphy," we will only say that we do not know why it is still included in this otherwise practical book. Chapter XIX., on "Adjustments, Electrical Measurements, and Fault-testing," gives much useful information, and should prove most valuable to all who have the care of wireless apparatus.

Those who have the design and calculation of new stations to attend to will find Chapter XX. of great assistance. This chapter consists almost entirely of an admirable translation of a paper by Signor Alfredo Montel with a few remarks by the author. We wish the author had taken a little more liberty with the translation- particularly with the notation, which he has left in the Continental style. The concluding chapter gives a large number of very useful tables, curves and notes. We think, however, that in the case of a straight line law the curves might be advantageously replaced by simple formulæ. For example: "Capacity in micro-microfarads of a parallel plate condenser = area in sq. cms. of either plate divided by twelve times distance in cms. between the plates," conveys the same (and indeed much more) information than Table IV., and is quite easy to remember. An account of the International Radio-telegraphic Convention is given in an Appendix, and a useful index adds to the worth of this valuable contribution to the literature of wireless telegraphy.

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Wireless as an Adjunct to a Great Stores

The Wanamaker Stations

A NOTABLE installation recently completed in the United States of America, and now working very satisfactorily, deserves recognition. There are some who have expressed doubts as to the practicability of wireless for overland communication, just as there were at one time sceptics whose ideas concerning overseas communication were, to paraphrase a well-known expression, "sicklied o'er with the pale cast of doubt." However, it soon became evident that the practical value of the principles discovered and so brilliantly applied by the genius of Mr. Marconi was dependent upon no chance conditions, but that it was determined upon sound lines. The wonderful achievements of maritime wireless telegraphy, heralded throughout all civilised countries, and made known in the distant corners of the world to which news percolate through slow and cumbersome channels, have made belief in the system well-nigh universal. But less well known, though none the less real, are the conquests made in overland communication.

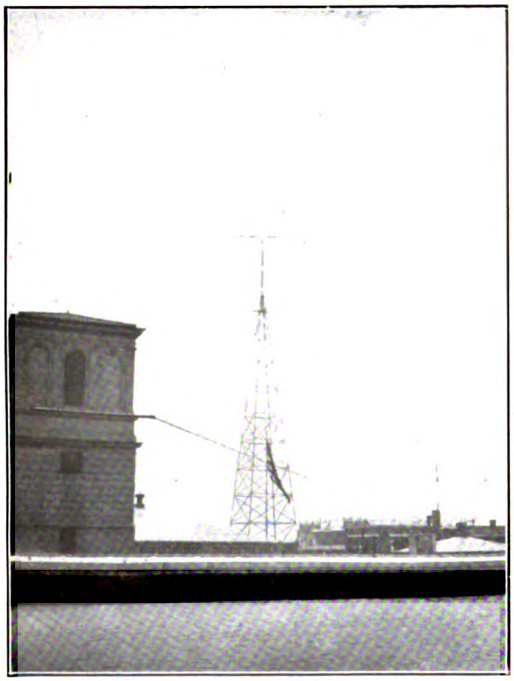

Fig. 1.—East Tower of the Wanamaker Station, Philadelphia.

In America, where postal regulations do not interfere with telegraphic communication to the extent that they do in this country, important developments have taken place, one of the most recent being the equipment of the great Wanamaker Stores in New York and Philadelphia with Marconi installations. The stores in question are of immense size and variety, and the establishment of wireless stations have not only a large advertising value, but they will result in an actual saving to the Wanamaker Stores of from eight to nine thousand dollars per annum in telephone charges. Both buildings are of modern fireproof construction, the one in Philadelphia being twelve stories high, and the New York Stores reaching the mammoth height of fifteen stories. Upon the roof of each building two steel towers have been erected with heavy topmasts, the over-all height being 120 ft. The east tower of the Philadelphia station is shown in Fig. 1. The latest American type 5-k.w. Marconi transmitting sets with disc dischargers and valve receivers are used, and the stations have been tuned to a transmitting wave length of 1,800 metres, and by this wave length communication between New York and Philadelphia, a distance of ninety miles overland, is negotiated with great ease and without any interference from the thousand and one commercial and amateur installations in the immediate vicinity of each station. Fig. 2 shows the operating room, and Fig. 3 the generating set, both of which are at Philadelphia.

The stations are also used for the transmission of messages received at the Wanamaker Stores to ships at sea, and for the large quantity of private messages between New York and Philadelphia. The service has been so satisfactory that it has been found possible to dispense with the private wire telephone service formerly serving as the means of communication between the two stores.

Both the New York and Philadelphia stations have been heard by ships as far east as Sable Island, a distance of some 800 miles, a large portion of which is overland.

It might be added that the stations are open for general public service between the hours of 8.30 a.m. and 6 p.m. on weekdays. They

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are worked by operators in the employ of the Wanamaker Stores, as the American Marconi Company do not undertake inter-state business. On the day of opening the service the Mayor

realised the stimulus that wireless telegraphy can give to business, and the unqualified success of the Marconi installations on the roofs of his gigantic stores in New York and Philadelphia

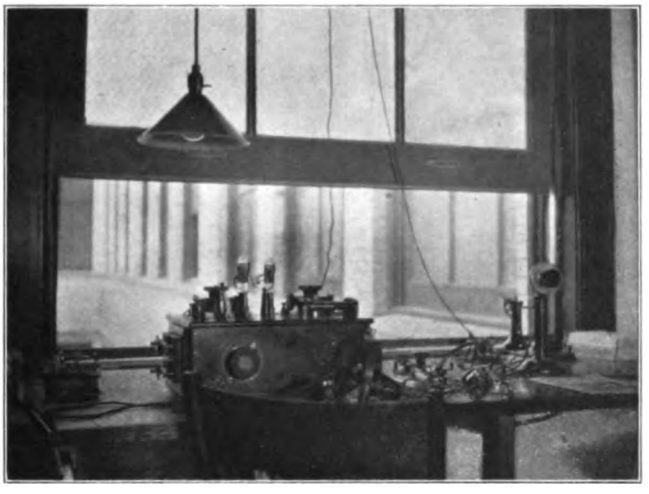

Fig. 2.—View of the Operating Room at the Wanamaker Station, Philadelphia.

of Philadelphia sent the following message to the Mayor of New York:

> Sincere greetings and congratulations on the completion of enterprise which gives Wanamaker Wireless one more tie for service and friendship to unite our cities.

Mr. George Wanamaker, ever to the fore where commercial enterprise is concerned, has is substantial food for reflection. The public appreciation of the advantages of these installations vies with the commercial benefit which accrues to the Wanamaker Stores, and there is reason to believe that the example will be extensively followed in those countries where the postal regulations do not prevent the use of private telegraphs.

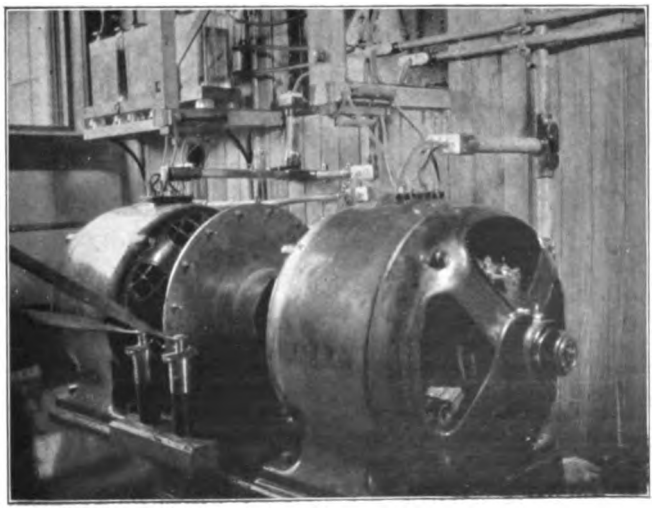

Fig. 3.—The 5-k.w. Transmitting Sets.

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Australasian News

(*From a Correspondent.*)

Sydney, June 2nd.

There has apparently been some lack of enterprise in the Southern Dominion. It is some years since Capt. Walker, on behalf of Marconi's Wireless Telegraph Co., succeeded in establishing communication between King Island, Tasmania, and the mainland, but up to the early part of June no commercial stations were operating, either in Australia or New Zealand. This state of affairs will soon give way, however, to one more in harmony with the spirit of the age, for work has already commenced on the site of the proposed Government Wireless Station at Pennant Hills, near Sydney, and some of the buildings are in course of erection, but no date can be given yet for possible completion of the station. Arrangements are being made by the Commonwealth Government for the provision of temporary stations at Sydney and Melbourne.

Until about three years ago the arrival here of a merchant ship equipped with wireless telegraphy was a thing of rare occurrence; but since the two large mail shipping companies, the P. and O. and the Orient Line, have set an example by equipping their liners with Marconi apparatus, other shipping lines engaged in the Australasian trade have been quick to follow suit. At present there are thirty passenger ships sailing between British ports and Sydney and Melbourne which are equipped with Marconi apparatus.

These vessels belong to five different lines, and represent a gross tonnage of over 306,174. In addition to these lines is the *Zealandia*, which sails between Canada (Vancouver) and Australia.

The coasting ships, employed in the Australian interstate services, are among the finest coastal steamers in the world. The first of these to have Marconi apparatus installed was the SS. "Karoola," which belongs to Messrs. MacIlwraith, McEacharn Proprietary Co., Ltd., of Melbourne, and the SS. "Grantala" and the "Koombana," of the Adelaide Steamship Co., Ltd. The 1½-k.w. standard ship sets have been installed on these ships, and it is expected that others will shortly be equipped with similar sets.

Marconi operators on the ships arriving here have reported that communications have been held by them with other ships and with coast stations over distances from 800 to 2,000 miles at night. All ships report good communication with the Marconi Station at Durban.

Canadian News

Montreal, 17th July, 1911.

The Marconi Wireless Telegraph Co. of Canada, Ltd., have submitted to the Dominion Government a return showing the number of messages and the number of words handled through the Canadian stations during the year ended March 31st, 1911. The company's stations are at Halifax, Sable Island, Cape Sable, St. John, North Sydney, Pictou, Cape Bear, Cape Race, Cape Ray, Fame Point, Clarke City, Father Point, Heath Point, Belle Isle, Point Amour, Point Rich, and Harrington. The number of messages handled reached a total of 87,180, representing 960,641 words. September, 1910, holds the record as the month in which the largest number of messages were handled, viz., 10,108 messages, representing 150,897 words; next comes August, with 9,838 messages and 132,329 words.

In a recent issue the *Railway and Marine World* publishes the following paragraph: "In connection with recent Press reports to the effect that the Northern Navigation Co. intended to equip its vessels with wireless telegraphy apparatus this year, we are officially advised that as there are no receiving stations on the Canadian side of the lakes it would be useless to so equip the vessels at present." Mr. N. G. Neill, Industrial Commissioner, Port Arthur, Ontario, has written to the Canadian Co. with reference to the above as follows:

"A wireless telegraph station was erected at Port Arthur in the fall of 1910, and established communication with the other stations on Lake Superior—namely, at Isle Royal, Grand Marias, Duluth and Calumet. It was very shortly after the station was in operation that the advantages of the wireless telegraph were demonstrated. The steamer 'Dunelm' of the Inland Lines went ashore on Isle Royal, and although she was not equipped with the apparatus, a freighter which had the wireless telegraph apparatus strung between her masts was within sight of her distress rockets and immediately flashed the distress signals to the wireless station at Port Arthur. The powerful tug 'James Whalen' was immediately sent to her assistance. The advantages of this invention were further shown when the wrecking outfit was working alongside of the 'Dunelm.' By constant exchange of messages being kept up between the wreck and Port Arthur, the boats were warned of approaching storms and enabled to seek shelter in the neighbouring bays during operations. The hazardous work of towing the wreck to the dry docks at Port Arthur was shortly afterwards undertaken."

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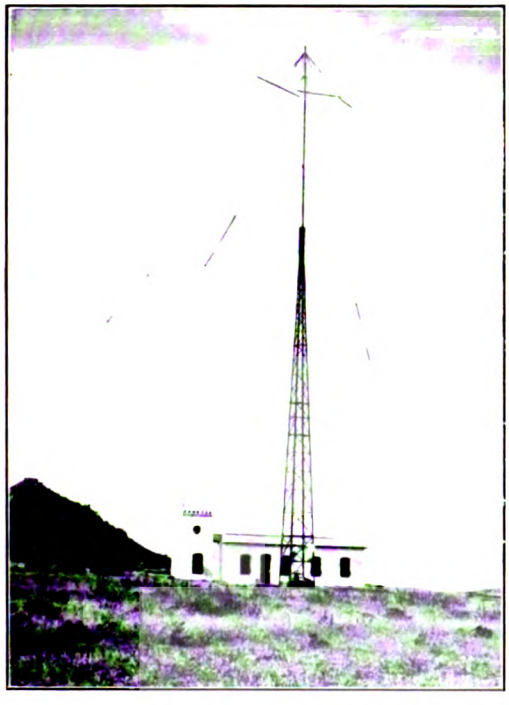
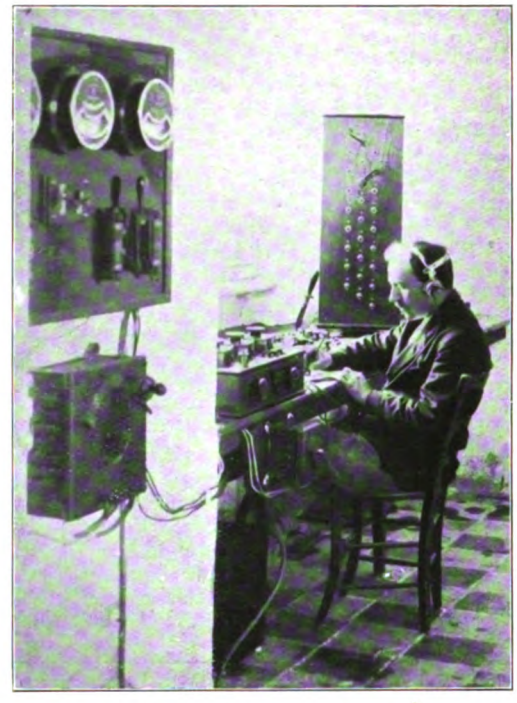
Stations Round the Italian Coast

Ten years ago a number of small wireless stations were erected round the coast of Italy. At that time wireless telegraphy was in its practical and commercial infancy; the genius of Mr. Marconi was incessantly occupied in the development of his wonderful ideas, and the world had not yet awakened to the immense potentialities which his investigations possessed. But these stations helped to show what the Marconi system was then capable of doing. The cycle of time has wrought many changes, notable among which is the inability of the present Italian stations to cope with the traffic which it is now called upon to handle. These stations, twelve in number, were of an



The Aerials at Castiadas

average of 2 k.w. each, and they have carried out a considerable amount of work with exceedingly good results. Some of the stations are only open for business during the day, others by appointment, and one or two are limited to ship requirements. In the course of time, however, those stations will be superseded by much larger ones, a commencement in this process of evolution having already set in. In addition to the large station at Rome, particulars of which are given on page 1 of this issue, orders have already been received for three new 15-k.w. stations, one each at Venice, Taranto, and Spezia. Others are in contemplation. One station has recently been erected at Castiadas, near Cagliari, Sardinia, and we are able to show two interesting photographs thereof.



Instrument Room—Operator Receiving a Message.

One of these photographs shows the aerials which have been specially insulated to ensure a good earth. One cannot help but notice the daintiness which the designer has been able to introduce into the mast, which from the purely artistic point of view is an improvement upon the plain construction of masts generally.

In the other photograph an operator is shown in the act of receiving a message.

The Castiadas station has been erected by the Marconi Company for the Italian Ministry of Posts and Telegraphs, but will be operated by a staff provided by the Italian Ministry of Marine. The station will shortly be opened for public service, and has been specially designed for communications with the Naples and Palermo stations. It will also communicate with sea-going vessels equipped with Marconi apparatus.

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Maritime Wireless Telegraphy

AS the date of publication of *The Marconigraph* has been altered so that, commencing with the present number, the journal will appear at an earlier date than formerly, it was necessary to close these pages for press before the end of July. In consequence of this we are able to print this month less than three weeks' record of the orders received for the equipment of ships, which accounts for the somewhat smaller list. Up to July 21st the following vessels were fitted by the Marconi International Marine Communication Co., Ltd., with 1½-k.w. and emergency apparatus, the names of the companies being given in parentheses: SS. "Tarquah" (Elder Dempster), SS. "Tainui" (Shaw, Savill and Albion Co.), CS. "Sherard Osborn" (Eastern Telegraph Co.), SS. "Drumcraig" (Chadwick and Sons), SS. "Gloucester Castle" (Union Castle Line), SS. "Ruapehu" (New Zealand Shipping Co.), SS. "Asian" and SS. "Antillian" (Leyland Line), SS. "Christopher" (Booth Line), SS. "Ben-My-Chree" and SS. "Viking" (The Isle of Man Steam Packet Co.).

In addition to the afore-named, the following vessels are now being equipped with Marconi apparatus: The SS. "Pancras" and the SS. "Antony" for the Booth Line, and the SS. "Herefordshire" for the Bibby Line.

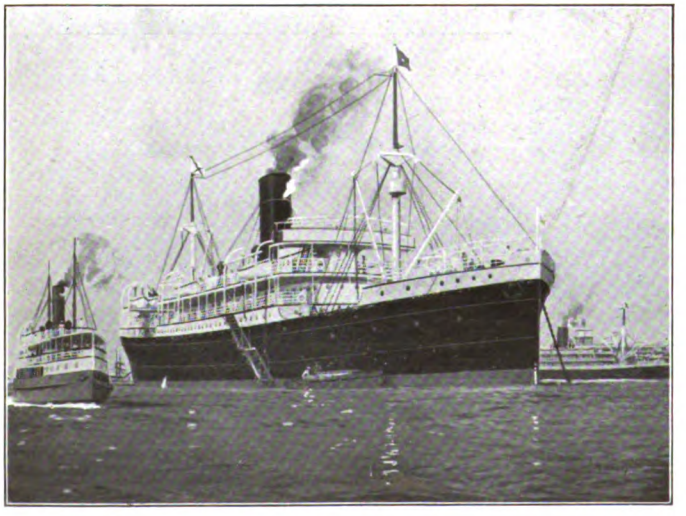
The Marconi International Marine Communication Co., Ltd., have also concluded an agreement with the Trinidad Shipping and Trading Co. for the equipment of their three steamers, the "Grenada," "Maracas" and "Pegu" (subsequently to be renamed "Mayaro"). These installations will comprise standard sets.

Of Messrs. Elder Dempsters Company's express boats, running between Liverpool and West Africa, the SS. "Karina" is the latest to be fitted with the Marconi Company's standard plant. This vessel is the second of the African service to be fitted with wireless apparatus, but it is the intention of the owners to have all their express steamers on this route similarly equipped.

The SS. "Pachitea," belonging to Compania Peruana de Vapores y Dique del Callao, trading on the west coast of South America, has also been fitted.

An agreement has been made between the French Government and the Marconi Companies, whereby the restrictions hitherto imposed on French vessels fitted with the Marconi apparatus against communicating on the high seas with ships fitted with other systems of wireless telegraphy has been removed. The removal of these restrictions also applies to certain stations along the French coasts, and in future communication by wireless will be allowed without restriction between all vessels carrying wireless installations.

The Italian Agency of the Marconi Company have made arrangements for the publishing of a "wireless" newspaper on board one of the Lloyd Italiano's steamers.



The SS. "Christopher" of the Booth Line

New Wireless Rate for Ship Business

It is announced that important reductions in the charges in the radio-telegraphic service have been made by the Dominion Government of Canada and have now come into force.

A ten-word message may now be sent for 50 cents, whereas the old rate was $1.20.

The new rate only applies to ship business, such as vessels communicating with their owners on land.

This reduction will undoubtedly draw a great business to the Dominion Government stations on the coast.

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Movements of Telegraphists

Mr. A. B. Bower has been transferred from the "China" to "Persia," both belonging to the P. and O.

Mr. J. R. T. Williams, formerly second operator on "Romanic," has been transferred to the "Batavier V." (Batavier Line).

Mr. A. J. Matt Lysse, late of the "Batavier," has been appointed for duty at the Cadiz Station.

Mr. H. E. Penrose has been transferred from the P. and O. vessel "Mantua" to the "Osterley," belonging to the Orient Line.

Mr. H. W. Leach, late of the "Minnehaha," has returned to Clifden, where he formerly spent two years.

Mr. P. Partington has gone from the "Clearense" (Booth Line) to the "Minnehaha" (Atlantic Transport Line).

Mr. W. Crabb, late of the "Andorinha" (Yeoward Bros.), has been transferred to the "Manda" (Aberdeen Direct Line).

Mr. T. Muschamp, late second operator on the "Lusitania," is now on the New Zealand SS. Co.'s "Knapehu."

Mr. N. B. W. Wheeler, late of the "Ortego" (Pacific Steam Navigation Co.), has been transferred to the "Themistocles," of the Aberdeen White Star Line.

Mr. D. Sutherland, late of the "Caledonia," Anchor Line, transferred to the new Union Castle boat, "Gloucester Castle."

Mr. E. W. Hynes, who on February 24th was unable to sail on the SS. "Saturnia" owing to illness, is now recovered and is on the Anchor liner, "Caledonia."

Mr. J. Calwell has been appointed to take charge of the equipment of the P. and O. "Mantua."

Mr. H. Rowlands, of Liverpool, has taken charge of the installation on the "Montfort," owned by the Canadian Pacific Railway.

Mr. A. T. Thompson, who was appointed to the "Drumcraig," was taken ill two days before that vessel was due to leave Cardiff. Mr. J. Brennan, of the Liverpool depôt, has replaced him.

Mr. H. Roffey has gone from the Liverpool depôt to the Allan liner "Pretorian."

Mr. J. G. Phillips is now on the "Buchaneer," and Mr. S. W. Spicer has taken his place on the "Saxon."

Mr. G. A. Manson, late of the "Saxon," and Mr. T. Stubbs, late of the "Albania," have been appointed to the Las Palmas Station.

Mr. E. G. Rice, late of the "Minnewaska," has been appointed to the White Star liner "Majestic."

Mr. T. J. Barron has been appointed to the Cadiz Station.

Movements of Engineers

Mr. E. J. Watts, who returned from Sofia in June, proceeded to Cape Colony on a special mission on July 15th.

Mr. N. C. Rackstraw duly reported on his return from Cocos and Singapore, and is at present on leave, having suffered from slight malaria.

Mr. S. F. Kos sailed for Borneo on the SS. "Vondel," joining the ship in Genoa on July 20th. The illustration shows Mr. Kos tuning up on the SS. "Balmoral Castle," which was one of the first of the Union Castle liners to be fitted with wireless.

Mr. S. L. Dashwood and Mr. H. McCullough sailed for India about the end of July for the purpose of assisting in the completion of the wireless telegraph stations now being erected for the Indian Government. Mr. S. R. Groser is due to leave for India a fortnight later.

Mr. C. James, on completion of the installation on the Turkish cruiser "Hamadieh," now at Southampton, will sail with that ship.

Mr. H. Caswall left on Saturday, July 22nd, for Constantinople to install the wireless telegraph plant at the station being erected there by Marconi's Wireless Telegraph Co. for the Turkish Government. The masts and buildings in connection with that station are now completed.

Scholastic Note

The following entered as learners at the Liverpool School of Wireless Telegraphy during July: Messrs. A. D. Giles, H. N. Gibson, C. M. Allnutt, C. Searl, R. A. C. Lee, S. A. Leith, B. A. Gillett, W. C. Carr and D. Robertson.

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Travelling Inspectors

The Marconi International Marine Communication Co., Ltd., announce that they have appointed thirteen travelling inspectors, whose duties are: (a) To take charge of installations on ships; (b) to observe the working of ship and shore stations and, whenever necessary, to report to head office instances of inattention or bad working; (c) to visit the company's ship stations in foreign ports, inspect installations, verify maintenance certificates, and render to operators any assistance that may be required; (d) to install apparatus on ships when required.

Each inspector will have a letter or card of identification, which he will present, in order that the operator in charge of a station may give the necessary facilities for inspecting and overhauling the apparatus. Below is a list of those who have been appointed to the positions, together with a brief record of their career in the service of the company:—

W. DAVIES.—Joined Company June, 1902, and at the time of receiving his present appointment was in charge of the installation on the R.M.S. "Mauretania." He has served on various ships, and worked in Russia, Amsterdam, and other places.

J. R. STAPLETON.—First became associated with the Company in September, 1903. Previously he was in charge of installations on the R.M.S.S. "Oceanic," the "Briton," the S.Y. "Lysistrata," and other ships.

H. J. TATTERSALL.—Joined the Company January, 1904. Previously in charge of installations on R.M.S.S. "Baltic," "Aragon," "Columbia," and other ships. He was also in a sealing schooner, and at Malin Head shore station.

A. J. IRVINE.—Joined the Company January, 1904. Previously in charge of the installations on the R.M.S.S. "Umbria," "Caronia," "Orsova," and "Suevic." He was also at Clifden transatlantic station.

W. I. MCGHEE.—Joined the Company March, 1904. Previously in charge of installations on the R.M.S.S. "Carmania," "Virginian," and other ships.

J. R. ROBINSON.—Has been with the Company since August, 1904, before which he was in charge of installations on the R.M.S.S. "Adriatic," "Celtic," "Malwa," "Empress of Ireland," and other ships.

H. F. WHITE.—Also joined in August, 1904. Previously he was in charge of installations on the R.M.S.S. "Avon," "Majestic," and other ships.

W. PLATT.—Another who joined the Company in August, 1904. Was at different times in charge of installations on the R.M.S.S. "Baltic," "Carmania," "Laurentic," and at Clifden transatlantic station.

J. R. BINNS.—Became a member of the staff in April, 1905. He has been in charge of installations on the R.M.S.S. "Caronia," "Grosser Kurfurst," "Adriatic," and other ships.

S. SMITH.—Before joining the Company in August, 1905, he was in charge of installations on the R.M.S.S. "Asturias," "Carmania," and several other ships.

E. J. MOORE.—Joined the Company in January, 1907. Previously he was in charge of installations on the R.M.S.S. "Adriatic," "Araguaya," "Leicestershire," and other ships.

A. F. GOODLIFFE.—Joined the Company in February, 1908. Previously he was in charge of installations on the R.M.S.S. "Minnehaha," "Montezuma," "Mantua," and several other ships.

G. W. BALFOUR.—Joined the Company in September, 1908, after serving on the R.M.S.S. "Baltic," "Virginia," and other ships.

Appeal to the Benevolent

We should like to remind our readers of two funds which have been opened, one for the benefit of Mrs. W. J. Croxon and the other for Mrs. McIntyre. Both of these ladies had the misfortune to lose their husbands, who were in the service of the Company, and it is the outcome of a desire on the part of the colleagues of the deceased that funds have been opened to make provision for the widows and families. Since the announcement was made in the June issue of the death of Mr. McIntyre, the sum of £5 16s. has been collected from operators reporting at the London office, whilst Miss E. M. Wythes, of Birmingham, has kindly invited Mrs. McIntyre to stay with her for three months. We are grateful to Miss Wythes for her munificent offer, and trust it will be the means of enabling us to augment the fund for Mrs. McIntyre.

No less deserving of support is Mrs. W. J. Croxon, whose husband, as we announced last month, died as the result of an operation for cancer, leaving behind him a widow and one child. Ten shillings has been received from Mr. and Mrs. B. Pontifex, which is gratefully acknowledged. We feel sure that our appeal to the staffs of the Marconi Co.'s, and to the greater public who are interested in wireless telegraphy and who follow its progress in the pages of *The Marconigraph*, for support for Mrs. Croxon will not be in vain.

Contributions for either or both of the above funds, addressed to the Editor, *The Marconigraph*, Watergate House, Adelphi, London, W.C., will be acknowledged in the journal. Below is a list of the subscribers to Mrs. McIntyre's fund:

	s.	d.
J. Lewis	5	0
J. R. Binns ...	10	0
H. W. Leach ...	2	6
J. Pringle ...	2	6
E. W. Fielding ...	2	6
T. J. Barron ...	5	0
W. C. Matthews	2	6
G. J. Wright ...	3	0
J. R. T. Williams	2	6
P. H. Johnson ...	5	0
E. N. M. Wroughton	5	0
A. F. Goodliffe ...	5	0
A. J. Reynolds ...	2	6
W. H. Haywood	5	0
W. McGhee ...	5	0
J. D. Taylor ...	2	6
J. R. Stapleton ...	5	0
Carried forward £3	10	6

	£	s.	d.
Brought ford.	3	10	6
J. H. Welply ...		2	6
J. R. Robinson ...		5	0
T. H. Stubbs ...		5	0
C. J. Hunter ...		2	6
R. B. Croft ...		2	6
F. Skeet ...		2	6
G. W. Spicer ...		2	6
A. E. Baker ...		2	6
E. J. Moore ...		5	0
H. Ward		2	6
A. C. Caldwell ...		2	6
R. J. Thompson		2	6
R. Cox		2	6
H. J. Gallagher...		2	6
L. L. Jones ...		2	6
Anonymous ...		0	6
Total ...	£5	16	0

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Question and Answer

[Under this heading we shall be pleased to answer any inquiries of general interest which our readers may address to us, or to deal with practical problems concerning which additional information may be required.]

Electron.—Long-Distance Telegraphy.—A discussion arose in a circle of friends interested in wireless telegraphy as to the distance that a message can now be transmitted. Can you enlighted me? *Reply.*—Commercial messages pass regularly and with complete success between Clifden (Ireland) and Glace Bay (Nova Scotia), a distance of 2,300 miles. Last year, however, Mr. Marconi was successful in receiving signals at Buenos Ayres from Clifden, a distance of more than 6,000 miles, which is the greatest distance for wireless messages known.

Personal

Lieutenant Frederick Cross, R.N.R., Instructor on board the White Star training-ship "Mersey," has obtained a certificate of proficiency in radio-telegraphy granted by the Postmaster-General. Lieutenant Cross, who is in charge of the Marconi installation fitted on board the training-ship "Mersey," is the first officer of the British mercantile marine to pass the Government examination in radio-telegraphy.

Mr. Jack R. Irwin, the man who made Wellman famous, and who has been touring the Western States of America lecturing on wireless telegraphy, was recently married to Miss Helen MacPage at Portland, Ore.

Chess Match by Wireless

M.P.L. rang out the call—the operator of the Marconi wireless station on the Union Castle Liner "Kinfauns Castle," always on the alert for danger signals, stood ready—but his fears were groundless. The message from the "Marathon" was in the nature of a chess challenge. A game of chess was thereupon fixed up between the passengers of these two vessels, then 200 miles apart, and after close play a very interesting match ended in a victory for the "Kinfauns Castle."

Wireless for the Farmer

The wonderful accomplishments of wireless have lately been added to by the invention of what is known as the Plant Life Energiser, by Mr. Joseph Moritz, an electrical engineer of New York City. Numerous experiments have in past years demonstrated the value of electricity in cultivation. The newest apparatus, operated by wireless, not only does what has heretofore been accomplished by the older methods but goes much further. In a series of experiments, covering the better part of three years, wireless methods have produced not only a hardier but more prolific growth. In one culture of the well-known "Hoffman Strawberries," Mr. Moritz produced by his wireless apparatus a berry which matured forty-one days earlier than ever before, and this in the same soil alongside of non-electrified berries. By a unique application of this invention it has been found that wireless will successfully stamp out the pest which has caused immense loss to the fruit growers, namely, the San Jose scale. It has likewise been found that frosts can be warded off. There is no doubt that this invention will be of inestimable value to farmers and agriculturists throughout the world. A brief description of the apparatus can be best given by describing a central sending station, with pin point receivers placed at the head and foot of each row under cultivation, the current being transmitted from receiver to receiver.

It was suggested in a Parliamentary question during the past month that the G.P.O. was loaning telegraphists from the Central Telegraph Office to the Dead Letter Office. "Wireless telegraphy, no doubt," was the comment of a *Star* humorist. Perhaps the witticism will become apparent after a "surgical operation."

A U.S. sailor, said to be feeling thirsty, tried to induce a San Francisco shopkeeper to sell him goods for "the men on board," intending to turn the receipts into drink. The shopkeeper becoming suspicious, communicating with the U.S. "Pennsylvania" by wireless, found his customer to be a fraud, and handed him over to the police.

Sir Edward Morris, the Premier of Newfoundland, was the guest of the Liverpool Corporation prior to his departure at the beginning of last month. Sir Wilfrid Laurier had already left Liverpool by the "Empress of Britain," but the vessel was held up in the Mersey and a wireless invitation was sent to Sir Wilfrid to attend the lunch.

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The Trapping of Criminals.

When, if ever, the history of crime and criminology comes to be written the chapters devoted to the age in which we are now living will stand out conspicuously for the wonderful achievements made by wireless telegraphy in the trapping of fugitives from justice. To the list of delinquents who have been brought within reach of the law by the long arm of wireless must be added yet another. The municipality of Mantua, in Italy, had been defrauded by one of its officials to the extent of 300,000 lire. Upon the defalcation being discovered, the delinquent absconded and took passage on board the "Principe Umberto" at Genoa for Buenos Aires. His whereabouts for some time remained a mystery, but the Genoa detectives were consulted just in time to enable them to have him arrested as he was leaving the Italian steamship at Buenos Aires. Wireless telegraphy played an important part in the capture, for the Uruguayan authorities were able to make inquiries on board the vessel when nearing their coast, advise Genoa of the result, and so enable the arrest to be made when the steamer reached her destination.

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Excursionists' Marconigrams.

The annual summer excursion of the employees of the Sittingbourne Paper Mills took place on Saturday, July 15th, and incidentally furnished another striking example of the general value and applicability of wireless. A special train conveyed 1,100 excursionists to Dover and Folkestone, and a party crossed the Channel to Boulogne. As the boat was late in returning, there was a danger that the special train would leave Folkestone before the Channel trippers reached the shore. But a Marconigram was despatched from the steamer (which was fortunately equipped with wireless) to Folkestone, and the train was held up until the Boulogne party arrived. This is the first time in the history of these excursions that Marconigrams have been used with such conspicuous success.

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In response to wireless messages sent from the steamer "Tottenham," which was wrecked on the island of Juan de Nova, near Madagascar, the officers and crew were rescued by H.M.S. "Forte," which was despatched to their aid. They were landed at Durban, and eventually arrived safely at Plymouth. The "Tottenham" had been ashore three weeks, during which several efforts had been made to refloat her, but without success.

Athletics.

The ten-miles walking race held during the month among the members of the Marconi Athletic Club of Chelmsford resulted in a victory for A. Garner, G. Dumenal and H. Corfield being respectively second and third. Owing to its failure to obtain sufficient starters, the club had to abandon the proposed entry of a cycling team at the Essex County Sports. W. W. Spalding, one of the members, however, received a medal in the high jump contest at these sports for successfully clearing over five feet.

The Marconi Athletic Club of London has not met with any pronounced success during the month in their cricket matches. Five matches have been played, all of which were lost, the club being much handicapped by several of its best members being unable from various causes to turn out.

It has been decided, says *The Western Morning News*, to shorten and simplify the syllabus of the wireless telegraphy course for signal officers as follows:—

The course will last five weeks (25 working days). During the first week instruction will be given in elementary electricity, including the following subjects:—First day, electricity, preliminary lecture; second day, dynamos and motors; third day, lighting; fourth day, searchlight, flashing lamp, etc.; fifth day, telegraphy. The remaining four weeks will be devoted to wireless telegraphy.

Marks will be awarded as follows:—Organization of wave lengths and procedure, 150; wireless telegraphy, paper, 100; wireless telegraphy, practical, 100; signals, practical, 50; total, 400. In order to pass, officers will be required to obtain 70 per cent. in the examination in organization and procedure, and also 70 per cent. of the total.

✦

"Practical Electricity," by the late Professor W. E. Ayrton and Thomas Mather, F.R.S., M.I.E.E. (Cassell, 9s. net), is a book which is essentially a text-book and laboratory guide for a first-year student who desires to take up "Practical Electricity" as a business or profession. The book has been carried out mainly on the late Professor Ayrton's own lines, embodying his natural method of instruction as distinguished from the mode of the mere scholastic primer. Commencing with an explanation of what is meant by electric current, the book deals subsequently with magnetic fields, with various measuring and indicating instruments, and in particular with several kinds of ampere-hour meters.

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THE MARCONIGRAPH

No. 6. September, 1911. Subscription, 3/- per annum, post free. Price 2d. Post Free 3d.

Wireless Telegraphy in Ceylon

TO the contracts entered into by Marconi's Wireless Telegraph Co., Ltd., of which particulars are given on this page monthly, must now be added one with the Crown Agents for the Colonies for the establishment of a radio-telegraph station in Ceylon. The station will be capable normally of sending a wave length 600 metres in length. In addition, however, with any wave between 1,000 and 2,000 metres, the station will maintain communication with any ship off Madras or with any ship up to a distance of 450 miles over sea (except during periods of severe atmospheric disturbances), provided the ship is fitted with an aerial having a mean height of not less than 100 feet, and suitable receiving apparatus.

The generator will consist of a 10-h.p. S.P. motor, taking power (alternating current at 100 volts, 60 cycles) from mains, direct coupled to a 5-k.w. alternator and exciter. The motor, alternator and exciter will be protected against injurious induced effects from the high-frequency circuit by special shunting resistances. One 5-k.w. iron core low-frequency primary inductance will be provided for tuning the low-frequency circuit to the disc frequency. A high-tension transformer will be provided for stepping up the alternating current supplied by the generator to the voltage required by the battery of condensers. The latter will comprise eight whole glass plate condensers in galvanised iron oil-tight tanks, with the necessary insulating stands, busbars, high-tension bushed terminals, and other fittings. The busbars and connectors will be designed to provide for minimum inductance and damping, and with suitable arrangements for coupling up as required for the production of the various waves specified. In conjunction with the condenser battery, a high-frequency tuning inductance of the continuously adjustable type will be provided for tuning the high-frequency primary circuit to the aerial circuit. The discharger will be of the disc type direct coupled to the motor alternator, and designed to produce a musical spark enabling the transmitted signals to be distinguished from atmospheric disturbances when received in the telephone by a corresponding station.

Two aerial tuning inductances will be provided, each consisting of a multiple solenoid winding of stranded conductor, similar to that of the jigger secondary. The manipulating gear will consist of a Morse key to be placed in the operating room to electrically actuate a relay key in the transformer primary circuit, the supply being taken for this purpose from the exciter of the alternator. One part of the receiving apparatus will consist of a magnetic detector in combination with a multiple tuner which will be constructed to provide a highly syntonised circuit for all waves between 100 and 2,500 metres, and will be furnished with a change switch to permit of the instantaneous change from "tuned" position to an "untuned" stand-by position, for the purpose of picking up signals of a widely different wave length without variation in adjustment. The other receiver will be of the valve type; the valve detector will be used in place of the magnetic detector, and the wave length in reception from 1,600 to 4,000 metres. Two masts will be provided, each of sectional type tubular steel with wooden mast, 270 feet in height over all. They will have a factor of safety of 4, assuming a wind pressure of 40 lbs. per square foot. One earth system will be provided for the use of all waves, consisting of galvanised iron plates arranged in a circle with radial conductors to the central apparatus. The earth plates will be supplemented by additional radial wires underneath the transmitting aerial for the purpose of better providing for the electric oscillation between the aerial and the earth.

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MAJOR SAMUEL FLOOD-PAGE

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Major Samuel Flood-Page

Director of Marconi's Wireless Telegraph Co., Ltd., etc.

IN considering a man's personality, it is difficult to estimate justly the various causes which combine to build up what we will call "character"; what is due to hereditary descent, what to early surroundings, what to the circumstances and influences of later life, and what to the power of will which controls and directs these causes and moulds a man's career. Major S. Flood-Page, who well merits inclusion in our portrait gallery of "wireless" notabilities, inherits to a peculiar degree certain ancestral traits. His father was the Rev. S. Flood-Page and his mother was a daughter of Colonel Shaw, who saw considerable military service, and while in the 60th Rifles was wounded at the taking of Quebec in 1759. Major Flood-Page became a cadet in 1854 and in the following year was gazetted to the Second Madras European Light Infantry. He served in India and Burmah and was first adjutant of the Queen's Own Edinburgh Rifle Brigade and then for twelve years adjutant of the London Scottish. His services were largely sought by the military authorities for administrative purposes, and as a proof of the regard in which his great capacity for organisation was recognised it may be mentioned that he was the first executive officer of the National Rifle Association, remaining on the council of that body for 40 years: and is now a vice-president.

Important as were his military achievements, in the conduct of which he was eminently successful, it is his association with business enterprises that have given the gallant major a position of prominence in financial and commercial circles. He was at one time secretary and manager of the Crystal Palace, from which position he retired in 1882. We next find him interested in electric lighting, and we venture to predict that when the commercial history of electric lighting comes to be recorded Major Flood-Page will hold a noteworthy and honourable position in that record.

The 'eighties were remarkable indeed for the outburst of activity in electric lighting, so soon as sound engineering construction had been applied to the magneto-electric generator and the mechanical production of electric currents had thus been assured, electric lighting was bound to progress. Already the arc-lamp was in limited use. The year 1878 had seen the Avenue de l'Opéra in Paris lit with Jablochkoff's now historic "candles," and a little later Swan and Edison had brought the carbon glow lamp into precarious existence. About that time Sir Joseph W. (then Mr.) Swan and his friends in Newcastle formed a company for the manufacture of the Swan glow-lamp. Major Flood-Page was instrumental in introducing the first incandescent electric light into Australia, and then became secretary and manager of the Edison and Swan United Electric Light Company, Limited.

The advent of wireless telegraphy brought many scientific and commercial observers into its fold. One of these was the subject of our present sketch. Major Flood-Page joined Marconi's Wireless Telegraph Co., Ltd., as managing director in 1899, and has remained from those early days, and still remains, a director of the company. He has been for some twenty years a member of the Council of the London Chamber of Commerce and was largely instrumental in forming the electrical section of the Chamber. The Church Army also finds in him an earnest supporter.

In the case of a man of so active and varied a career it would be an interesting study to depict features, trace lineages and realise how character has been affected by circumstances. Such a task is beyond the scope of the present article, however. Though by no means in the first flush of youth, Major Flood-Page is possessed of a vigour, a clarity of vision, firmness of resolution and steadfastness of purpose which many a man, younger than he in years, has passed. Not to him can be applied the lament of the Greek historian: "I am too old, O King, and slow to stir; so bid thou one of the younger men here to do these things." There is much work still to be done in the field of wireless, and we hope that for many years yet Major Flood-Page will be able to take the same honoured part that he does at present.

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Journalism at Sea

The Cape Cod Station

BEFORE the invention of the electric telegraph some sixty odd years ago the news of the world travelled very slowly and events became history almost as soon as they were universally known. The papers of that day had to content themselves with the news of their locality and long-delayed reports of doings in the world at large. It required weeks and months for one half of the world to learn what the other half had been engaged in doing. By the development of vast telegraph systems in this and foreign countries the man of to-day may pick up his newspaper at the breakfast-table and read of the very latest happenings at home and abroad. With what scorn he would refuse yesterday's paper! A few years ago, when a man was worn and nervous from the strain of his business, it was customary for his physician to recommend an ocean voyage for his rest and refreshment. During his trip he could enjoy absolute immunity from his business worries. Nowadays, however, there is no such thing as freedom from business for the man of affairs. Each morning on his journey across the ocean he finds beside his plate at the breakfast-table a newspaper printed on board containing the latest news of the day. While he may have resolved to forget entirely the things left behind, it is more than human nature can resist to leave untouched the little newspaper, and he is soon eagerly perusing the happenings of yesterday or glancing at the quotations of his favourite stocks.

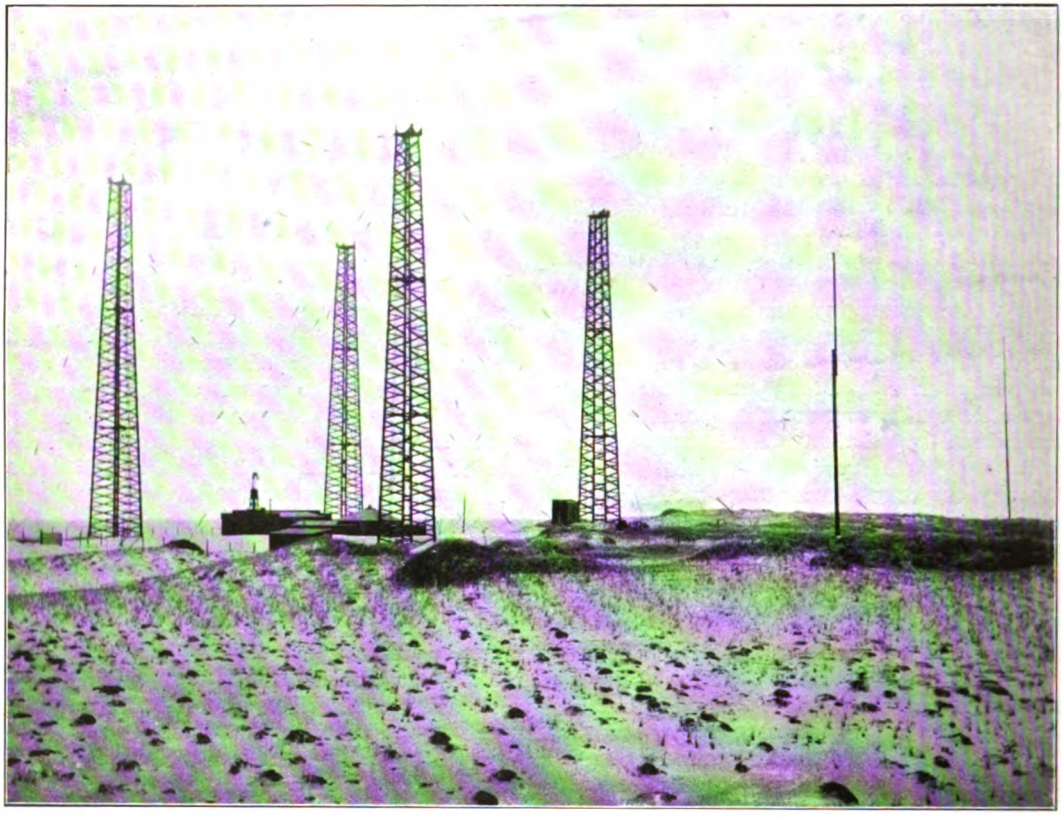

Fig. 1.—High Power Marconi Station at Cape Cod.

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Fig. 2.—View of the Buildings at Cape Cod.

The machinery necessary to make possible the publication of a daily paper in mid-Atlantic is very much the same as that required for any of the great city newspapers, except, of course, on a much smaller scale. There is, however, one marked point of difference and that is in the manner in which the news is transmitted to the editorial room. Every day in the year at 8.30 p.m. a special despatch is prepared at the Associated Press office in New York and telegraphed direct to the Marconi Station at Cape Cod, South Wellfleet, Mass. From here, by means of wireless telegraphy, the world's news is sent out to vessels hundreds of miles distant on the broad Atlantic. The aerial wires supported by the masts of each steamer intercept a sufficient number of the ether vibrations sent out by the Cape Cod transmitter to operate the sensitive receiving apparatus, the operator records the message, and in the morning the traveller finds the news that has come so far and has been printed while he slept.

Perhaps it might be interesting to say something of the station at Cape Cod, the methods by which the news is transmitted, and the little company of men who form the working force. The plant is about two miles from the railway station at South Wellfleet, Massachusetts, and is situated directly on a huge sand bluff that overlooks the Atlantic Ocean. There is little here but sand, the kind that stays awhile and then moves on. In fact, it is not uncommon for some of the buildings to be almost buried during a single storm. A species of coarse grass alone succeeds in drawing nourishment from the sand, and to this vegetation Cape Cod owes its existence, for without it the Cape would long since have blown away. A few years ago the wireless station was in charge of an engineer who determined that he would have a garden and who worked with persistence and desperation in order to make a few plants grow. When, by dint of much effort, he had succeeded in coaxing a few green shrubs to survive, a superannuated horse, belonging to the station, which had outlived its usefulness and was kept solely out of kindness, crushed them all by choosing the garden as its resting-place.

Four huge towers, each two hundred and fifteen feet high, support a great network of copper wires, the lower ends of which lead into the transmitting room (fig. 1). These wires, when charged, set in vibration the ether for fifteen hundred miles around. Under the shade of these towers nestle the several buildings containing the plant. A low brick structure houses the great engines and humming dynamos that furnish the necessary power for the transmission of messages to great distances. Under the same roof is also located a storage battery of colossal size and a machine-shop. Connected to this building by a long corridor are the transmitting and operating rooms (fig. 2), in which occur the wonderful display of electrical pyrotechnics that has caused the plant to be dubbed "Marconi's thunder factory."

About a thousand feet from the plant is situated the comfortable little bungalow (fig. 3) that shelters the men employed at the station. There is a plank walk from the plant to the house and many are the tales told of trying to keep to the path on a stormy night when the ground is covered with snow and the air full of blinding sleet, or of endeavouring to reach the bungalow when a fierce wind is blowing that drives the loose sand against the men's faces with such force as almost to draw blood. On one occasion during a heavy storm the manager became confused in attempting to make the passage from the house to the plant and only succeeded in reaching his destination by following the wire fence which encloses the grounds for its entire length.

The bungalow in which the men live is as pleasant and cosy as one could wish for. There is a huge living room, furnished with comfortable chairs and couches, the walls are hung with pictures and on the tables are scattered books and magazines. Most of the men endeavour to play some musical instrument and, whatever the result may be, there are no neighbours to raise complaints. They have a phonograph and a great number of records. It is worth mentioning that anyone guilty of using profane language has to pay a fine for each offence; the money so raised is used to buy records; or if any of the men go to Boston for a short vacation they have to buy a half-dozen records for the privilege. Each man has a bedroom to himself; there are two guest rooms; the manager has his larger

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room and office, and there is a very pleasant dining-room.

The happy family, for it is a happy family, consists of a manager, two telegraph operators, two engineers and two old salts as riggers, a chef and steward, and two dogs, Missy and Mike. The manager is the technical man and wireless engineer of the plant, in addition to his position as head of the family. The two telegraph operators take shifts in working the land lines and wireless circuits, for this station is also used for communication with Boston shipping. The engineers stand watch on alternate nights to start the main engines and to keep them running smoothly. There are also a thousand and one things for them to do during the day—some repairing, improvements to be made or experiments for the engineer at the head office in New York. The riggers keep the towers and stays in ship shape. They may be seen almost any day perched far aloft, tightening a rope here, replacing a fouled wire of the antennæ there, putting in their time wherever it may be most needed. Painting the towers is a job that keeps them busy for many weeks at a time with extra men to help. The chef or steward is the one man who has it in his power to make the family either happy or miserable, and misery is little known here. It requires considerable foresight and good management to keep the larder well supplied at this out-of-the-way place, and many of the provisions must come from Boston. With some help from the town store, the wares of local fishermen and an occasional mess of flounders caught from the bank by the men when off duty, the commissariat department is kept well supplied. The chef had a unique experience a short time ago. He was standing by the kitchen boiler during a storm and was rather roughly handled by a stroke of lightning. The men chaffed him a good deal over the fact that he could have received a fifty-thousand-volt shock at the plant any day without doing anything so commonplace as to be struck by lightning in his own kitchen.

There are two members of the family who cannot be depended upon for any work—unless you consider hunting moles and rabbits as such—but who are always ready to join in any sport, and who are always happy and free from care. These are the two dogs Missy and Mike. Missy, a fox terrier by courtesy, makes up in intelligence whatever she may lack in pedigree; and Mike, a bull terrier of equally mysterious ancestry, is always ready for a frolic. These two dogs are firm friends—even if Mike does lack some of the essentials of gallantry. The dogs are ever ready for a stroll on the beach with the men, and if one chances to forget that Missy's favourite pastime is bringing a stick or a stone that has been thrown into the breakers, he is gently reminded of it in the best of dog language. Missy will plunge in, swim out and lug in the stick or dive for the stone that is thrown. Mike obligingly waits on the beach until she gets almost to shore and then wades in, just getting his toes wet, takes the prize from her mouth and walks up to the one who threw it and expects all the glory.

On one occasion, Missy went off on a hunting trip by herself and failed to return. The men became worried after two days had passed and organised a search party for her, taking the valiant Mike along. The search continued for the better part of a day without result, but just as failure seemed evident, Mike pricked up his ears and with joyful yelps led the party into the brush where he had heard a feeble call from his playmate. There was Missy with one little paw firmly clamped in a murderous steel trap which some law breaker had set for catching game. The injured paw was released from the trap and Missy carried back to the station, where kind hands ministered to her. Though a part of her foot is missing, she still has enough left to enjoy the good times with the men.

The family gather for a late breakfast in the morning, for some have been up until 2 o'clock on duty, and then starts the business of the day. There are various tasks to engage the men during the daytime, but it is at night that the real work of the station begins. At 8.30 p.m. the operator on duty hears a call on the land line, and he is at once busy copying on his typewriter the news despatch from the Associated Press. He then takes his copy down to the plant and starts punching the strip. This opera-

Fig. 3.—Operators' Quarters.

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tion is one recently added to the daily régime, and is the means by which the entire news message is sent automatically in perfect Morse characters without the operator touching a key. In order to ensure the receiving of the message by the ships at sea, many of which are at distances too great to ask for repetitions of certain words they may have missed, the entire news despatch is repeated several times. In the days when the operator must needs send this long message four times by means of a huge telegraph key, in addition to receiving it from New York over the land line, the news became rather a bore, especially when the hours of the morning were small and the man's eyes heavy for sleep. The message having been punched on the paper, the strip is then wound on a reel attached to the motor-driven automatic transmitter, and is then ready for the programme, which starts at 10 o'clock each night and continues until completed.

At 9.30 the engineer on watch hastens down from the dwelling house to the plant and starts three great flaming torches, in order to heat the ignition balls of the kerosene engines. Oil engines are used in this plant because of the high cost of coal and the difficulty of delivering it at the station. By 9.50 o'clock all is in readiness—the engines are running and the recording instruments are inspected to note whether the current value is correct. When the clock points exactly at ten a red signal light flashes in the engine room, the operator releases the catch on the automatic transmitter and the crashing noise of the spark is immediately heard in the adjoining room. Here in the transmitting room great streams of fire a foot long are thrown out by powerful blowers and the tremendous noise of the spark, though musical, is terrifying. Very few persons have seen this plant in operation, for visitors are strictly prohibited from entering upon the premises, but one may hear the high-pitched note of the powerful spark for several miles if the night be quiet or the wind favourable. Through the windows of the station the spark has been seen for fifteen miles

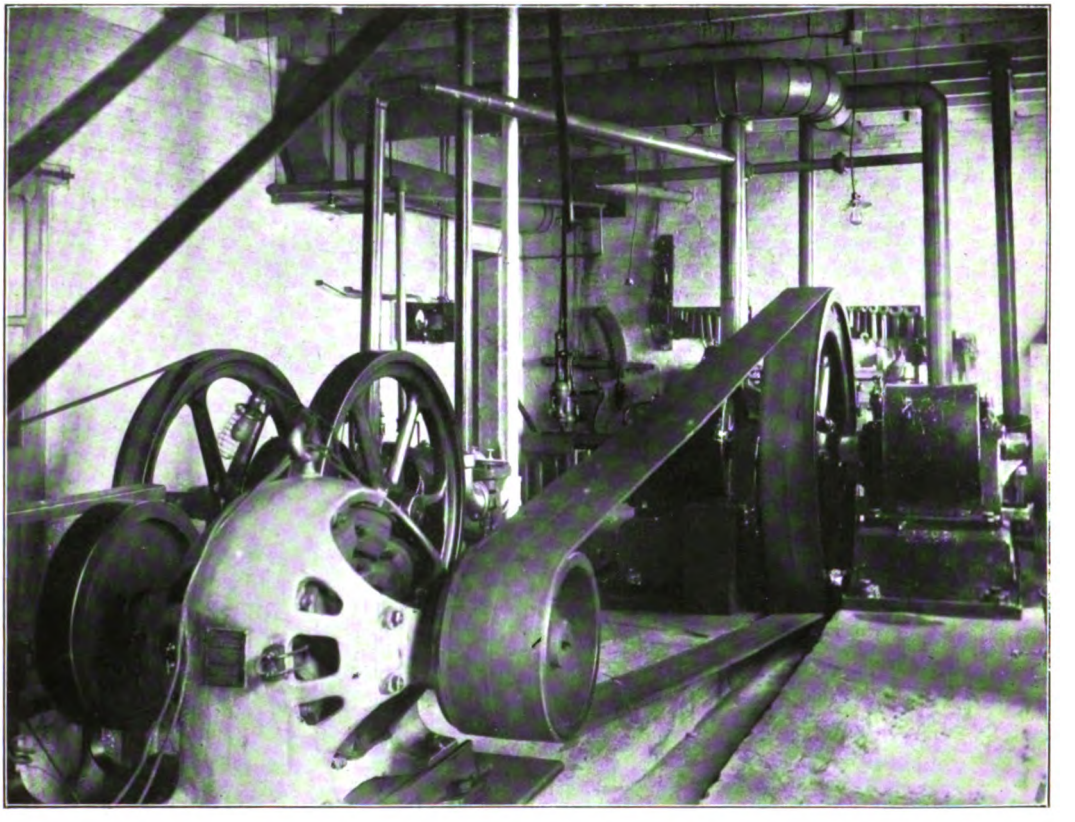

Fig. 4.—Engine Room, showing Plant.

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at sea. Viewed from the exterior, the intense white flash showing through the ground glass windows of the instrument room and the deafening crash of the spark would cause one to believe that here is the home of the evil one. In this way the great plant is calling to ships near and far and sending them the news of the day. The ships may be fifteen hundred miles or only one hundred miles away and, unless the vessel is at the greater distance, the operator usually copies the complete despatch correctly the first time without recourse to the repetitions that follow.

While the operator at Cape Cod is busy sending out the day's despatch, on each one of the numerous ships on the broad Atlantic there listens an attentive ear.

Between the masts of each vessel are strung horizontally several stranded copper wires about the diameter of a pencil. These wires are separated by wooden spreaders and carefully insulated by special hard rubber insulators from the masts and their attendant stays. Several vertical wires are connected at the centre of the horizontal ones, and these lead directly through an insulator into the wireless cabin, usually located on the upper deck.

The modern Marconi cabin aboard ship is divided into several sections. There is usually an inside companion way for the convenience of passengers, and this leads into a reception room where messages may be filed for transmission. Directly adjoining this reception room is the main portion of the wireless cabin, where the man on watch answers the thousand and one questions propounded to him by fair passengers, while those not so fair must content themselves with a somewhat more brief description of the wizardry of wireless. A sample of the efficacy of explaining wireless to a passenger is well illustrated by the story of an operator who, in the days in which the received signals were recorded on a paper strip, had particularly prided himself upon an especially lucid description of the *modus operandi* of wireless telegraphy to a fair passenger. Upon thanking him for his courtesy, the lady remarked that she understood it all perfectly, but would he tell her how the paper tape reached the ships from shore without getting wet. Next to the main room is the living room of the two operators, and it is as comfortable a little cabin as there is on the ship. There are two berths, a writing desk, a chair or two, and, in fact, all the comforts of bachelor life. At meal time the men repair to the main saloon and dine with the passengers, or, if business be heavy, as it often is on the larger vessels, the meals may be served by the steward in the Marconi cabin. There are two other and much smaller rooms opening from the main cabin—the first contains the entire wireless equipment used for transmitting, while in the latter is located the receiving apparatus. Here are the special and sensitive instruments in which we are particularly interested. This room is especially constructed with sound-proof walls, several inches thick, and lined with cork. These more modern accommodations are in marked contrast to the quarters on the older vessels with which the operators had to content themselves. They were limited to one small room, which contained the wireless apparatus and a berth. There was barely room to turn around in, and, if perchance, the Marconi man was of the long variety the chances were his feet extended under the instrument table when he turned in for a few hours' sleep.

Each night, a few minutes before ten, the operator in charge shuts himself in the little sound-proof room, provides himself with pad and pencil, adjusts the pair of telephone receivers to his head and awaits the stroke of ten. Exactly on the minute, the faintest little whisper is heard in the telephones. The giant spark at Cape Cod is saying, " Good evening, ships, good evening, ships." These signals, though somewhat faint, are quite distinct, and may be likened to the gentle purring of a contented kitten, though they are not so loud. Quite recently it has been discovered that the human ear is more sensitive to a higher musical note than that which was produced by the spark formerly in use, which was at the rate of four thousand sparks per minute. The new musical spark has a frequency of thirty-six thousand impulses per minute, and is readable at considerably greater distances with the same power. In the meanwhile, with receivers tightly pressed against his ears, the operator is rapidly writing down pages of news. This continues for about an hour, at the end of which time the despatch is complete. The copy is then quickly transcribed on the typewriter and hurried down to the " editor on board " of the *Atlantic Daily News*.

When the copy is ready it is turned over to the typesetter, who prepares the type in the good old way in vogue in newspaper offices before the advent of the linotype machine. By long practice he has become very deft, and in a short time all is complete and passed over to the printer for his part of the work. The formes are rapidly adjusted to the motor-driven press.

The first wireless newspaper to be published on board a vessel crossing the Atlantic was a little sheet known as the *Transatlantic Times*. It appeared November 15th, 1899, and was published on board the American line steamer " St. Paul," *en route* for England. On this voyage the St. Paul carried Mr. Marconi and two of his engineers, returning from America, where they had been carrying on experiments with a new kind of telegraphy. The particular object of their visit had been to report the yacht races for the Associated Press, and as success

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had crowned their efforts, they were looking for new worlds to conquer. They decided to publish a newspaper on board ship, and obtained the latest news of interest from the Marconi station at the Needles. The papers were neatly printed, and were sold at a dollar a copy for the benefit of the Seamen's Fund. From this small beginning the idea gradually grew until the erection of high power stations at Cape Cod and Poldhu made possible the constant reception of news from land and a daily issue.

The *Atlantic Daily News* is a paper of from eight to ten pages, and is printed in the form of a magazine. On the outside cover there is a copy of some famous painting, a photograph of some prominent man, or an illustration of some article within. There are many items of interest in the paper, news from all parts of the globe, the quotations of the Stock Exchange, the latest gossip of the sporting world.

The papers are most eagerly sought after by the passengers, and they are scanned with absorbing interest. It is the great event of the day on shipboard, and conversation turns to the facts that have been made known by the advent of the little sheet. Of course, the barest facts are all that can appear in news despatches that aim to send as much information as possible in as short a form as is commensurate with making sense. The whys and wherefores that brought about a certain event are talked over in the smoking room and as the passengers pace the deck for their morning constitutional.

The bulletin board that is posted each day with the news of the steamer is the centre of a great deal of interest, and sometimes of amusement. The day's run is always noted down. Sometimes with good weather and favouring winds the vessel may have made unusually good time, or it may be that with a head wind and other bad conditions she may have not been able to make her usual number of knots. The names of the steamers with whom the wireless operator has been in touch are noted down, with any news of importance that he may have received from any of them. The passengers scan the horizon with great interest for a sight of the wonderful icebergs or enormous school of whales that are reported as having been seen by a nearby steamer. There is a feeling of pity, not unmixed with awe, when there is reported a derelict near at hand, and the man on watch does not cease for a minute his close scrutiny of the waters ahead until he feels that his vessel is out of danger from these perils of the sea.

For the last five years newspapers have been published daily on the Atlantic liners. From the individual efforts of the steamship companies, each of which printed its own paper with its own title, has developed a publication with an issue of several thousand copies daily, with a single management for all the lines.

Diary of Events.

[*Under this heading we give a monthly record of the progress of Marconi wireless telegraphy. Apart from the general and historical interest which attaches to such a compilation, we have reason to believe, from the number of inquiries that constantly reach us, that it will be of much service to lecturers, tutors and others who may be professionally interested in the subject. Appended are some notable events that have occurred in September of preceding years.*]

1897.

September 30th.—Experiments on Salisbury Plain and at Dover successfully carried out for the British Post Office on this and preceding days.

1898.

September 19th.—Installation at Madeira House, Bournemouth, removed to Poole Harbour, Dorset.

1899.

September 21st.—Stations established at Chelmsford and Dovercourt.

International Yacht Races between the "Shamrock" and the "Columbia" reported by wireless telegraphy for the *New York Herald*.

1901.

September 20th.- Masts at Poldhu wrecked during a heavy gale and subsequently replaced by four towers 210 ft. high.

School for training commercial staff opened at Frinton-on-Sea.

September 21st.—R.M.S. "Campania," belonging to the Cunard Line, left Liverpool on her first voyage fitted with Marconi apparatus.

September 26th.—Agreement entered into with Lloyd's for the installation of Marconi apparatus at Lloyd's stations throughout the world.

September 28th.- Cunard liner R.M.S. "Umbria" left Liverpool on her first voyage fitted with Marconi apparatus.

1902.

September 10th.—Mr. Marconi received wireless messages on the Italian battleship "Carlo Alberto" at Gibraltar, Spezia, and throughout Mediterranean voyage.

1908.

September 18th.—Agreement made with the Brazilian Government for installation of Marconi apparatus on ten destroyers.

September 18th.—Agreement made with Anglo-American Oil Co. for the equipment of "Tamarac" and "Narragansett," the first of such vessels to be fitted.

1909.

September 29th.- Sale to the Postmaster-General of certain land stations in Great Britain, and grant to the Postmaster-General of a licence for the limited use of the Company's patents.

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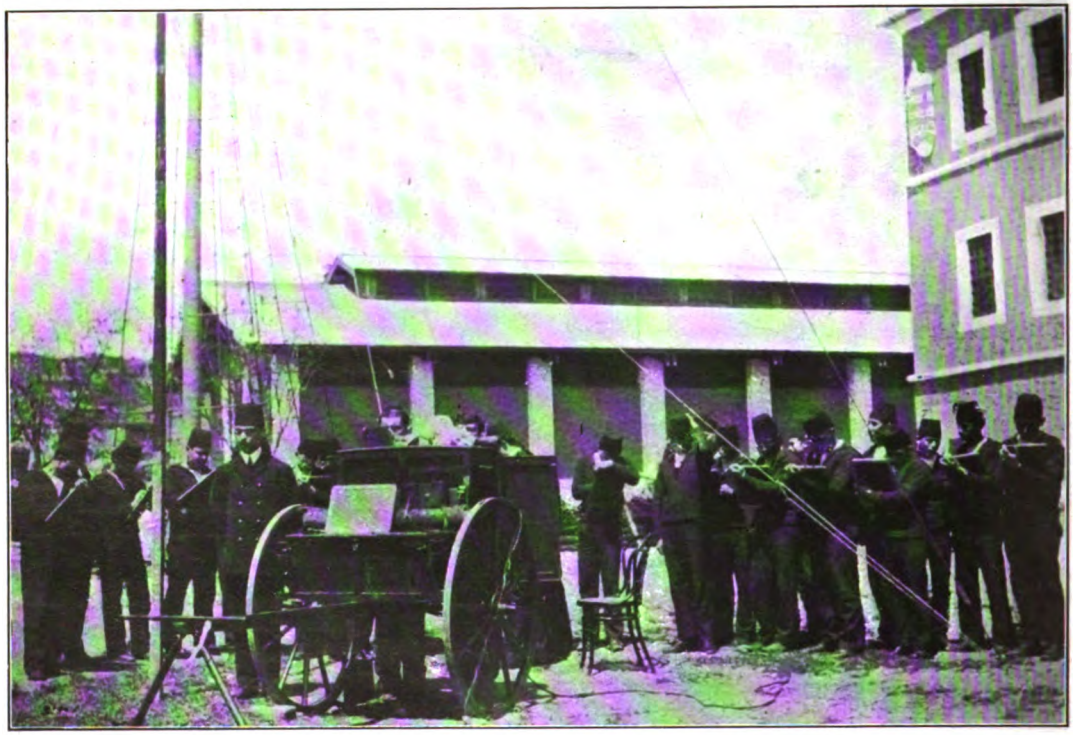
Field Station Work

Some Trials in Turkey

THE value of wireless telegraphy in military operations has been considerably enhanced by the development which the Marconi Company have effected in their apparatus for use in cavalry and infantry field telegraphy. At all events, such apparatus is now largely and increasingly used in various countries, and it is gratifying to note that there is no tendency on the part of Britain to lag behind other countries in this respect, for during recent summer camps of the Territorial Corps wireless field telegraphy formed an important part of the training. It is not intended in this article to deal exhaustively with the apparatus used in cavalry and infantry field wireless telegraphy, as this is a task which may appropriately be deferred until another occasion, when it will be possible to devote adequate space to the subject. But it might be as well to preface our account of some trials recently made in Turkey—one of the latest countries to take up field wireless telegraphy—by a brief description of the apparatus.

The cavalry set is designed to be carried on four horses or mules. One horse carries the engine and electric generator, which are mounted on opposite sides of the saddle. Each side of the saddle also carries a 2-gallon tank of petrol, and a 1-quart tank of lubricating oil. A small tool-bag is also carried, containing tools and spare parts. The telescopic driving shaft is carried in clips on the top of the frame. A second horse carries on one side a wooden case containing the transformer, and on the other side a wooden case containing the receiver with all accessories, spares, and the aerial circuit of the transmitter. A third horse carries the mast sections, spreaders, and earth net, all of which are kept in place by straps, which are tightened by a simple lever-clamping device. The fourth horse carries on one side a fibre case containing the mast stays, halyards, anchor



Naval Operators Reading from Spark and Writing the Message on Slates.

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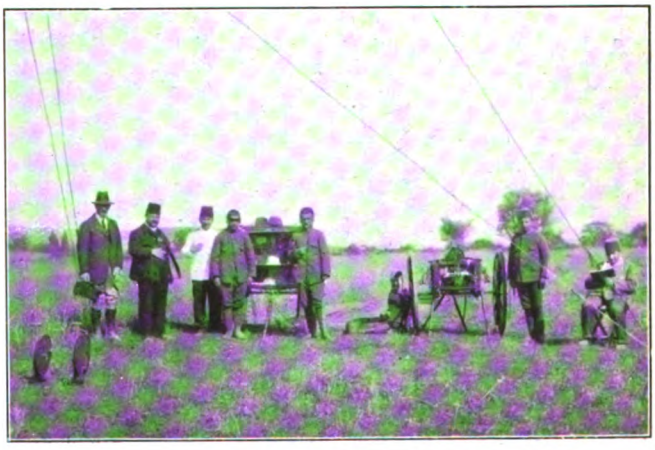
Commission in Mosque at Guebseh.

pegs, etc., and on the other side a fibre case containing the aerial wires on winding drums, with their standards, in addition to a wooden case containing the primary oscillating circuit as transmitter. The engine is of $2\frac{3}{4}$-h.p. air-cooled, with opposed cylinders, and the dynamo has an output of about half a kilowatt, and is coupled to the engine by means of a flexible shaft. The transformer is of open circuit type and connection is made to the primary oscillating circuit by means of spring nipples. The transmitter has three wave-lengths which ensures secrecy and freedom from interruption. The receiver is the latest pattern of valve receiver, and provision is also made for the use of a carborundum crystal. To arrange the instruments for working it is only necessary to put them one on the top of the other: first the transformer on the ground, then the transmitter, and the receiver-box on the top of all. The front is divided, the bottom part forming a table at a convenient height for working, the top and canvas sides forming protection against wind and rain. The two masts are 30 ft. high, and are built of wooden sections, all of which are interchangeable and can easily be erected by two men. With the full complement of six men the whole station can be set up in less than ten minutes. The infantry and cavalry sets are identical, except that in the case of the infantry station the instruments, etc., are carried on a light limbered cart drawn by one horse or by men. With two gallons of petrol and lubricating oil the set weighs 600 lb. or 700 lb., and will work well over distances of thirty miles.

A series of trials with cavalry and infantry field stations have recently been carried out in Turkey, and so successful were these that the Turkish Government have placed a substantial order with the Marconi Company for these types of station.

A Government Commission, consisting of six members, chosen from the army, navy and posts and telegraphs, sat to select the best system of "wireless" for military purposes. The Commission were from the commencement favourably impressed with the portability, speed of erection and ease of manipulation of the Marconi stations. At first it was necessary to teach the soldiers how to erect and work the stations, the essentials of which they quickly grasped, in spite of the difficulty of explaining them through an interpreter. Later, one of the stations was moved to the Naval Barracks at Kassim Pacha, and another was erected at the Military Barracks at Selimieh, the stations being respectively worked by the sailors and soldiers. The Sultan held a review at Selimieh Barracks while the stations were in operation, and he took a lively interest in the wireless.

The installation was then removed from Kassim Pacha to Guebseh in Anatolia, forty-five kilometres from Selimieh, where the other station remained. Half the Commission accompanied the out-station, the other half staying at Selimieh. Communication was at once established, the signals being very strong. The intervening country was undulating and largely cultivated, the greatest height being 1,000 ft. Two other systems were tried in addition to the Marconi, but they had great difficulty in communicating with their stations at Selimieh, one



Portable Station Erected. The Commission.

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being unable to get messages through for two days, and the other being unable to get any through at all. Those who went out from England in charge of the apparatus were living all this time in native inns, generally cooking their own food over a charcoal fire and often eating it with their fingers. The Commission lost a considerable part of their interest in "wireless" when meal-time approached and cooking operations were due to begin.

The site of the station was close to the railway at Guebseh, about two miles from the village of that name.

The last stage in the trials was from Derindjé, at the head of the Gulf of Ismid, to Geuz-tepé, a distance of seventy-five kilometres, the district from Guebseh to Derindjé being over very rocky country with considerably higher hills. Signals were good and a number of messages were transmitted and received by Turkish operators.

The different systems were here worked alternately for the sake of comparison, also a speed test of erection was carried out, the result being greatly in favour of the Marconi system. These latter tests lasted a week.

The report of the Commission was very favourable. Marconi "wireless" is being installed on most of the ships of the Turkish navy, and there is a great field for this means of communication in the country.

A Turkish Operator.

An Incident in the History of Wireless

The First Message Received from a Liner

ALTHOUGH young, wireless telegraphy has already a history from which a chapter may be culled as being specially applicable to the present time. In November, 1899, Mr. Marconi cabled from New York that he would communicate with his wireless station at the Needles from the SS. "St. Paul" as the vessel was approaching the English shore. Major Flood-Page and Mr. Jameson Davis went to the Isle of Wight (assistants were already there); the success was complete, and is described in the following letter from Major Flood-Page which appeared in *The Times* on November 15th, 1899. There is no reason for adding anything to that letter, depicting, as it does, Mr. Marconi's initial success from a liner steaming at about 20 knots an hour, which success had in it all the wondrous promise which has followed, and is following it, so that it is known and appreciated on all the seas of the world.

The incident is further interesting inasmuch as it gave rise to the publication of the humble *Transatlantic Times*, a copy of which is reproduced, which was printed on board the "St. Paul," eighty-five copies of which were sold on board at a dollar apiece—and sold in an hour. For this little *Transatlantic Times* is the progenitor not only of the daily wireless newspapers on board so many liners, but of *The Marconigraph* itself, which has already obtained a circulation of some thousands a month.

What follows is a copy of Major Flood-Page's letter:

"As Mr. Marconi left New York he cabled to the office of his company in London that he would speak to the Needles from the SS. 'St. Paul' on their arrival in English waters. Having ascertained that the 'St. Paul' was expected at Southampton on Wednesday, Mr. Jameson Davis and I met at Yarmouth on

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Tuesday afternoon and arrived at the Needles about 5 p.m. We had an assistant with us and set to work at once to speak to the Haven. Even in these days the arrival of the Atlantic steamers could not be timed to an hour, but those whom we consulted seemed to agree that the 'St. Paul' would pass up about 10 to 11 o'clock on Wednesday morning. To make assurance doubly sure one of the assistants passed the night in the instrument room, but his night was not disturbed by the ringing of his bell, and we were all left to sleep in peace. Between 6 and 7 a.m. I was down; everything was in order, the Needles resembled pillars of salt as one after the other they were lighted up by the brilliant sunrise. There was a thick haze over the sea, and it would have been possible for the liner to pass the Needles without our catching a sight of her. We chatted away pleasantly with Haven—a mere bagatelle of about eighty miles. Breakfast over, the sun was delicious as we paced on the lawn, but at sea the haze increased to fog; no ordinary signals could have been read from any ship passing the place at which we were.

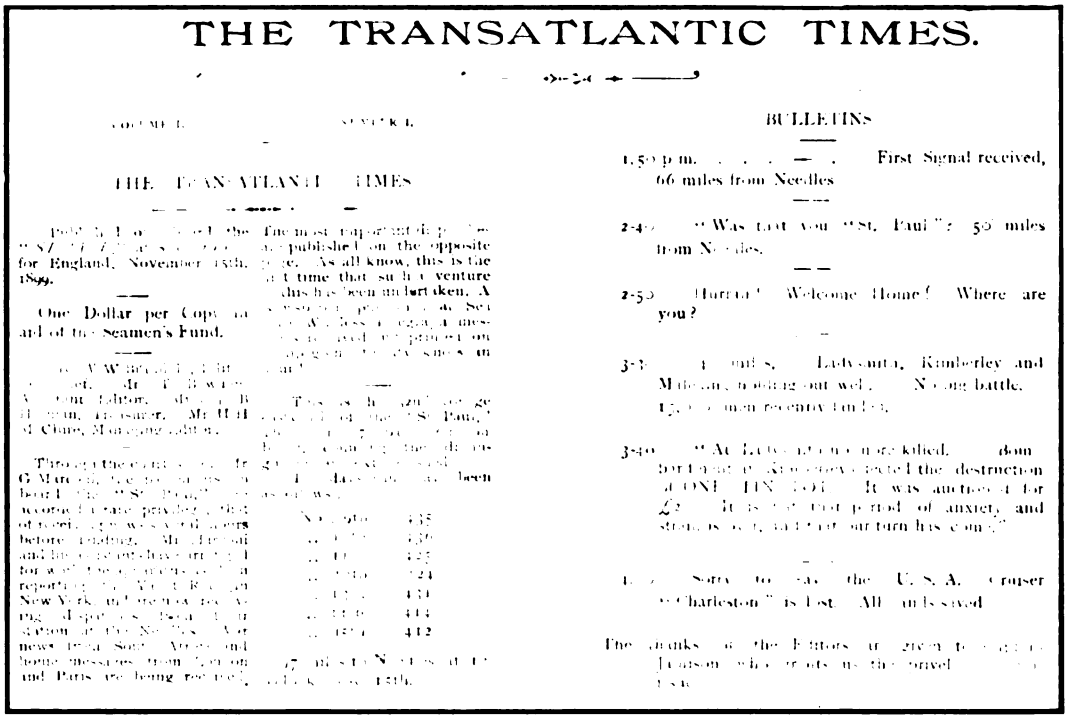
"The idea of failure never entered into our minds. So far as we were concerned, we were ready, and we felt complete confidence that the ship would be all right with Mr. Marconi himself on board.

"Yet, as may be easily imagined, we or, speaking for myself, I, at any rate—felt in a state of nervous tension. Waiting is ever tedious, but to wait for hours for the first liner that has ever approached these (or any other) shores with Marconi apparatus on board, and to wait from 10 to 11, when the steamer was expected, on to 12, to 1, to 2—it was not anxiety, it was certainly not doubt, not lack of confidence, but it was waiting.

"We sent out our signals over and over again, when, in the most natural and ordinary way, our bell rang. It was 2.45 p.m.

"'Is that you, "St. Paul"?' 'Yes.' 'Where are you?' 'Sixty-six nautical miles away.'

"Need I confess that delight, joy, satisfaction swept away all nervous tension, and in a few minutes we were transcribing, as if it were our daily occupation, four cablegrams for New York, and many telegrams for many parts of England and France, which had been sent fifty, forty-five, forty miles by 'wireless,' to be despatched from the Totland Bay Post Office."



THE TRANSATLANTIC TIMES.

BULLETINS

1.50 p.m. — First Signal received, 66 miles from Needles

2.45 "Was last you "St. Paul"? 50 miles from Needles.

2.50 Hurrah! Welcome Home! Where are you?

3.3 miles, Ladysmith, Kimberley and Mafeking looking out well. No long battle.

3.40 "At Ladysmith not killed. down DUNDONALD SIGNALS Relief the destruction ALONE HIN It was anchored for £2 It is first period of anxiety and strain is now our turn has come."

Sorry to say the U. S. A. Cruiser "Charleston" is Lost. All hands saved

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An Operator's Nightmare

By Harold Watterson

[AUTHOR'S NOTE. *"Wet Nelly" is the technical term which is employed on board ship to designate a peculiar variety of adamantine pastry, the composition of which is a trade secret. It is of peripteral form, and consists of two slabs of the composition welded under pressure by ship's currants. When removed from the dish it makes a squidgy noise. A large dose is fatal.*]

ALTHOUGH I could no longer see him, I knew that the ship's doctor sat by the side of my bed and that the end was drawing near, yet I received my sentence with indifference. "There is no hope," said the doctor; "he will pass away before night."

✦

That ship's doctor knew his business well! He adopted different tones of speech for the first, second and third class passengers. The steerage manner was curt and cold, to the second cabin he was matter-of-fact, but for wealthy saloon passengers was reserved a sympathetic bedside manner attained only by long and constant practice. On this occasion I noted subconsciously the use of the second cabin speech.

Fragments of conversation reached my ears, among which I could distinguish ". . . . great pity that the Board of Trade make us carry those wet nellys . . . " then the sounds faded, and I was awakened by a voice at my elbow saying—

"You might be careful where you put your feet!" and behold, it was an Angel holding a drawn sword, upon whose bare foot I had inadvertently trodden.

✦

We were in a lift together, descending with rapid speed. A gale blew upwards, walls streaked past, and the lift rocked as if in a heavy sea.

"Lowest platform," commanded the Angel to the person who served in the capacity of lift attendant; and turning to me, remarked plaintively, "You wireless people have given us a great deal of trouble; we've had to start on new excavations." All sense of time disappeared, and I found myself being led by my angelic guide along a narrow passage of wet and slimy rock through which a damp and acrid wind was blowing. Before us, clad in white and bearing keys, walked a clerk from the office.

Presently appeared a dim and shadowy square, about which wandered aimlessly a number of men, clad, alas, in a familiar uniform.

My companion no longer walked, but rather floated, with sword held aloft. In clarion tones he chanted forth, "These are they upon whom sentence hath been passed. Contention for Power is that for which they suffer." Even as he spoke, a violent quarrel broke out between a group of the prisoners. "You are only plain aerial," shouted one, "but as for me I am Power." "Power!" jeered another; "yes, 1½ kilowatt; why, I am five kilowatts, with a disc, too. But O"—here his voice broke and he sobbed bitterly, "I cannot get a spark."

✦

We moved onward and came to a battery of cavern cells, and the holder of the keys unlocked the first. In this sat one who in a ship at sea had mocked a painstaking German Marconi man for his quaint English. Now for all time the captive spoke as such himself. "How are weather in ocean?" he stuttered. "Is he good, don't it? Not comes never no signals of you." At a sign the jailer closed the cell and we passed down the aisle of caverns until we came to a door from which issued a frightful commotion.

"Before thee," vouchsafed my winged friend, "are they on whom time hung heavily and that wearied of ships of slow speed, comfortable withal, and with little work. Now they ever voyage upon vessels having sixteen red funnels, and so fast speed they that the days and the nights are as flickerings of black and of white."

We stood before a door sealed and barred. "Therein," said the Angel, "is a Marconi engineer who equipped ships with apparatus and left behind him bad connections. So he seeks for ever in inky darkness amid projections and sharp corners for the wires which he will never find."

The ground shelved sharply before us and a sulphurous smell was borne upon the cold, dank wind. From a crevice came a sound as of one feebly singing.

"Black guilt," chanted the Angel. "The prisoner read the works of one Omar Khayyám when he should have been standing at his instrument. Now hammereth he the butterfly and must ever sing aloud the poems which he himself composeth."

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At that a husky voice commenced :—

I was walking in the ocean
On a Sunday afternoon,
When I met a lobster salad,
But I hadn't got a spoon;
So I asked him if he'd mind it,
Just to make a little talk,
If I ate him with a solid silver
Nickel-plated fork.
And the lobster said he didn't mind a bit!

The voice swallowed painfully once or twice, then droned on :—

So we went into a garden,
And we sat upon a bench,
And he told me that his father
And his mother were both French.
When I questioned his veracity,
He fixed me with his gaze,
And said, "Well, just to prove it,
I'll sing a mayonnaise."
But the lobster couldn't sing a bit!

So I went into a barber's
And there I met a hare,
Who said, "I've lost my whisk·rs,
And *such* a lovely pair."
I said, "Are you a rabbit?"
He said, "O no, I ain't,
I'm a hare without my whiskers,"
Which I thought was rather quaint.
But the rabbit didn't think it quaint a bit!

We then passed along a gallery in which paced the victim of Sinful Pride, for ever condemned to parade before lovely ladies in boots down at heel, a uniform coat that wrinkled at the shoulders, and a week-old collar. The agony upon his face was awful.

Attracted by a swarm of flies and a smell of garlic, I found a hole in the ground from which issued a blast of heat, and was told that below was the model of a wireless cabin on a foreign steamer, designed for miscreants who grumble at British vessels. I was not impressed, for my trumpet-voiced guardian showed signs of asperity. I apologised, and remarked that I had sailed for a year on the "Nevermore." "That explains matters," said he, and smiled, but his voice hardened as he went on, "The 'Derelict' was not, as has been said, broken with hammers, plate by plate, beam by beam, and little rivet by little rivet. She voyages once in every moon upon the lake here below in perpetual tempest." Beads of perspiration rolled down my forehead, and I shuddered.

Turning to my floating guide, I was struck by his queer appearance. At close quarters his robes were patched and soiled, and the feathers of his wings tarnished. My eye caught an inscription on his sword. It ran :—

"Best rolled gold. Warranted to wear aeons."

He saw that I was curious, and dropping surprisingly into the vernacular, said, as he pointed to the sword, "Doesn't wear: tarnishes like billyho," and noting my perplexity, added, "Fallen angel: got the job of inspector down here!"

✦

The slope of the narrow path became rockier and more precipitous, the foul wind sucked and roared in the crevices. I could scarce keep my foothold, and sought anxiously in my mind how I might convey to my extraordinary companion my desire to end the journey. But words would not come and I was strangely nervous.

"Well," I blurted out at last, as I slid and scrambled down the rocks, "it's been good of you, you know, to take all this trouble to show your station to a visitor."

"But you are *not* a visitor," he thundered, while his presence grew vague and immense, and a blinding light shone in my eyes. And I heard a curious flat voice saying, "What about those faked long-distance messages?" "And who jammed the ocean on the 'Caronia'? And it seemed that the voice spoke in Morse with a noise like that of a Clifden spark, but the dots missed and the spacing was bad, and I had lost my pencil, and must needs write all down with fingers that were swollen beyond belief and miles in length.

"Do you know anything about burning out a coil with an electrolytic break?" shrieked the voice in signals that ran together and reversed at the same time. The volume of sound grew unbearable. Blinded and deafened I turned to flee, but the ground opened and I collapsed into a bottomless pit, enveloped in dense smoke and suffocated by an overpowering stench of burning ebonite. Down, down, I crashed from rock to rock, and then I heard my steward say respectfully, as he poked me, "Wake up, sir. Your tea is on the table."

And I looked, and behold upon the plate were two wet nellys, the syren was blowing for fog, and the captain paced the bridge.

Lord Provost M'Innes Shaw, of Glasgow, has had the unique experience of receiving a message of thanks to the Corporation by means of wireless telegraphy. It came from Captain Rolfsen, of the Norwegian gunboat "Frithjof," which left the Clyde recently after a brief visit, and the officers and crew of which were entertained by the Corporation. The message was dated from Malin Head.

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THE MARCONIGRAPH

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The Editor will be pleased to receive contributions; and Illustrated Articles will be particularly welcomed. All such as are accepted will be paid for.

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The Share Market.

Marconi shares have been active during the past month, notwithstanding the excitement caused on the London Stock Exchange by the industrial troubles. The closing prices on August 25 (the date we went to press) were as under:—

Ordinary	458. 6d.	468. 6d.
Preference	36. 3d.	388. 9d.

"The Marconigraph."

Since the publication of the first issue of *The Marconigraph* in April of this year we have effected various improvements in the literary pages, and it may now be asserted that *The Marconigraph* has taken a permanent place in the ranks of monthly journals. The reception accorded to the journal by the public and by the Press has more than justified expectations. The April and May issues have been completely exhausted, and since then we have been obliged to print increasing issues in order to satisfy the public demand. We have also reprinted the April and May issues, and the many readers who have from time to time asked for back numbers of *The Marconigraph* will be pleased to learn that they can now obtain them from the publisher.

Wireless Telegraphists.

Mr. Remnant, the Conservative Member for Holborn, recently asked the First Lord of the Admiralty in the House of Commons if orders had been issued, by circular or otherwise, to officers in command of His Majesty's ships that for the present no wireless telegraphists were to be allowed to leave His Majesty's service by purchasing their discharges in the ordinary way.

Mr. McKenna replied that the discharge by purchase of telegraphist ratings was not prohibited altogether, but orders were in force that all applications for such discharge should be carefully scrutinised and allowed only in really urgent cases. With the growing requirements of wireless telegraphy in the Fleet, it was desirable, he added, that the expansion of this new branch of the naval service should not be checked more than was necessary.

Wireless in the West.

At a recent meeting of the Bristol Docks Committee correspondence with the Postmaster-General relating to the establishment of a Marconi station at Avonmouth was submitted, and a letter was read from the Secretary of the General Post Office stating that so far as the public service of wireless telegraphy was concerned, the Postmaster-General was proposing to establish wireless telegraph stations at Land's End and Fishguard, which he "considers will enable a good service of wireless telegraph communication to be maintained between the port of Bristol and ships in the Bristol Channel." The letter added that the Postmaster-General did not think that an additional station at Avonmouth would be of public service. The matter is apparently not to be allowed to remain where it has been left by this letter, for we understand that the Board's officers are making further inquiries into the matter with a view of framing a reply to the Postmaster-General.

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Convention Notes

IN the communication issued from the office of the International Radio-telegraphic Convention at Berne it is announced that the Moroccan Government have signified their adherence to the Radio-telegraphic Convention.

Two appointments are notified. Mr. Justinian Oxenham, assistant secretary, has been promoted to the position of Secretary of the Department of Posts and Telegraphs of the Commonwealth of Australia in place of Sir Robert Townley Scott, who retired from the position on account of advancing years. Mr. C. C. P. Vigelius has been appointed to the post of Director-General of Posts, Telegraphs and Telephones in the Dutch Indies, in place of Mr. B. van Vianen. Mr. Vigelius has been authorised to sign letters and other documents in the name of the Inspector-General.

Particulars are given regarding the Montenegrin Coast station in Antivari. The geographical position of the station is 19° 07′ 00″ E, 42° 08′ 00″ N (Greenwich Meridian). The call letters are M A N. The system used is the Marconi, and the wave length is 500 metres. The station will be open for public service and for marine communications. The rate for ordinary messages from Montenegro to Italy is 0·15 fr. per word, and from Italy to Montenegro, 1 fr. plus 0·09 per word.

Wireless and Derelicts

SPECIAL arrangements have been made by the Postmaster-General for the transmission of radio-telegraphs between ships fitted with wireless telegraphic apparatus, and British coast stations in regard to the position of derelicts dangerous to navigation and weather and meteorological reports.

Whenever a derelict is observed lying in the track of ships and dangerous to navigation its position must be notified by means of wireless telegraphy to the nearest British coast station, which will immediately notify the Admiralty, Lloyd's, and the Meteorological Office, and forward the particulars by wireless telegraphy to ships proceeding on the North Atlantic, South Atlantic, and North Sea routes, as the case may be, for a period of four days after the receipt of the information. No shore station or inland charge will be made for this service.

Reports in regard to the local weather conditions prevailing at the Post Office wireless coast stations at Caister, Seaforth, North Foreland, Malin Head, Niton, Rosslare, Bolt Head, Crookhaven (Brow Head), and Lizard; or Lloyd's signal stations at Southend, Dover, Dungeness, Beachy Head, Horse Sand Fort, Portland Bill, Prawle Point, Scilly, Lundy Island, Barry Island, Smalls, Tuskar, Roche Point, Old Head of Kinsale, Fastnet, Inishtrahull, Torr Head, Kildonan, Butt of Lewis, Cape Wrath, Dunnet Head, St. Abb's Head, Tynemouth, Flamboro Head, Spurn Head, and Aldeburgh, can be obtained by sending a radio-telegraph to the nearest wireless station in the following form: "Indicate weather at . . . Captain . . . ." The shore station charge for the radio-telegraph and its reply will be 5s. If the inquiry necessitates the transmission of a telegraph to another station an additional charge will be made at the ordinary inland rate for the telegraph and the reply.

Information as to (1) the state of the weather in various parts of the Eastern Atlantic, the United Kingdom and the Continent; (2) weather forecasts for any part of the British coasts or ice in the Atlantic can be obtained by wireless telegraphy through the Post Office coast stations from the Meteorological Office. The radio-telegraph of inquiry should be worded as follows:—"Indicate (1) weather or (2) forecast, or (3) ice at . . . Meteorological, Captain . . . ." The shore station and meteorological charge for the radio-telegraph and the reply will be 5s. 6d., in addition to the cost of the inland telegraph to the Meteorological Office and of the reply. All radio-telegraphs sent to the coast stations in connection with these services must be forwarded in the name of the captain of the ship, and the shipowner will be held responsible for the charge incurred under sections 2 and 3. Forecasts are prepared at 10 a.m. and 7 p.m. daily and during the summer months at 2 p.m. also. In order to furnish the information in the most convenient form the reply message will, if no special particulars are required, be sent as in the following examples:—(1) S.W. 7 b c q, sea 5, fog 0. (2) Calm b, sea 0, fog 1. These would indicate south-west wind, strong, 7 blue sky, detached clouds, squally, rough sea, no fog or mist. (2) Calm, blue sky, sea calm, mist. The abbreviations denoting the state of weather will be as follows:—(b) blue sky, (c) clouds (detached), (d) drizzling rain, (e) wet air without rain, (f) fog, (g) gloom, (h) hail, (l) lightning, (m) mist, (o) overcast sky, (p) passing showers, (q) squalls, (r) rain, (s) snow, (t) thunder, (u) ugly, threatening sky, (v) visibility, objects at a distance unusually visible, (w) dew, (z) haze. A figure preceding these letters shows how many hours that kind of weather had prevailed since last observed—4 r, means four hours rain, 2½ l, means two and a half hours of vivid lightning. It is well to bear in mind that (w) means dew, but (d) drizzle; and (e) wet without rain, (p) passing showers of rain, and (q) squalls, but (s) snow; (h) hail, but (z) haze.

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Book Notices

"IMPERIAL TELEGRAPHIC COMMUNICATION," by Charles Bright, F.R.S.E. (P. S. King & Son, London: 3s. 6d. net.)

Few are so well entitled to be heard on the important subject of Imperial telegraphic communication as Mr. Charles Bright, the distinguished son of the promoter of the Atlantic cable in 1856, Sir Charles T. Bright, of whom the late Lord Kelvin said in 1889, "He was the engineer of this great undertaking [the first Atlantic cable], full of vigour, full of enthusiasm . . . to whom was due the laying of the cable." In the little book which lies on our table for review, Mr. Bright shows how much can be done towards Imperial unity and fostering trade betwixt the scattered units of the Empire by direct, efficient, and cheap telegraphic communication. He is in favour of leaving international cables completely in the hands of private enterprise, but he recommends that the State should take over what he calls existing "All-British" cables, and he considers further that the establishment of strategic lines comes within legitimate Government scope.

Mr. Bright's book is made up, in the main, of reproductions of certain papers, addresses and articles contributed at different periods, and may be said to form something like a history of the movement for extended and cheaper Imperial telegraphy. What concerns us chiefly is the position which Mr. Bright assigns to wireless in this respect. The wheels of time gradually but surely grind down the obstacles which many believed they saw in the possibilities in wireless telegraphy, and we welcome the friendly attitude which Mr. Bright now displays. He admits that there is great scope for wireless in the development of our Imperial telegraphic communications, but on an auxiliary basis. Why Mr. Bright should still believe in only a limited application of wireless after the splendid achievements of the Marconi system it is difficult to understand, and the only reason we can give is that the lecture in which the suggestion was made was delivered in 1902, although that forms no excuse for not bringing his book up-to-date as regards the possibilities opened out by later developments in wireless. He advocates wireless for a complete system of telegraphic communication round the entire coast of Great Britain and Ireland, in communication with various inland centres and military stations. Another radio-telegraphic installation which he recommends is that from the Philippines to Australia by way of either New Guinea or Borneo, whilst he considers that wireless telegraphy would be particularly well adapted for a news service between the various West Indian islands. "Wireless telegraphy," as Mr. Bright admits, "has now sufficiently proved the utility of its application to be recommended both as an auxiliary and reserve means of communication to the different parts of the Empire, and for establishing communication where, owing to prevailing conditions communication by cable is impossible or difficult to maintain. Wireless telegraphy should further be established on all the trade shipping routes throughout the Empire." This is an excellent piece of advice so far as it goes, but it is being shown daily that wireless is destined to play a far greater part in the world's and in the Empire's communications than Mr. Bright is at present disposed to acknowledge. However, it is something to have gained from him the approval which he pays in his book. This book is one which we can heartily recommend to anybody who desires to understand the important question of the telegraphic communications of the Empire.

"SCIENCE AND THE CRIMINAL," by C. Ainsworth Mitchell. (Sir Isaac Pitman & Sons, London: 6s. net.)

Contemporary reports show how scientific discovery is being utilised in the struggle between Society and the criminal. Mr. Mitchell has woven a complete account of these developments, and his book not only makes interesting reading but furnishes much food for thought. Apart from the undoubted scientific interest for which this book should be read, the author has brought human interest into his work, which should assure it a hearty reception. Space does not permit us to go as fully into Mr. Mitchell's fascinating book as we should like to indicate the various scientific means of detection and capture, identification, etc., which form the sixteen chapters of the book. A recent criminal case in which wireless telegraphy played a part of enormous importance is recalled, although the original details have scarcely had time to fade from memory. This indicates how up-to-date the book is. Of the event itself it is unnecessary to add anything here, but it made an unmistakable impression upon the public mind of the possibilities of wireless.

We have received some copies of recent issues of the *English Mechanic*, which is essentially a practical paper. As its name implies, all branches of mechanical science and engineering practice are treated in its columns. At present our contemporary is publishing a series of interesting articles on wireless telegraphy by Mr. W. J. Shaw, which will be found very instructive.

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Water Analogy of the Electrical Phenomena Occurring in the Circuits Employed for Wireless Telegraphy

By J. ST. VINCENT PLETTS

In the accompanying diagram the water and electrical circuits are made to correspond as nearly as possible, the analogous parts being marked with the same letters, but the two cases being distinguished by capital and small letters respectively.

The Apparatus.

THE generator consists in the water case of the propeller "G" enclosed in a cylinder, and in the electrical case of the dynamo "g." When the propeller is rotated a pressure or head or "hydromotive force" is created, which is measured in units called pounds per square inch. Whether any water flows or not the pressure is there. Similarly, when the armature of the dynamo is rotated a voltage, or potential, or electromotive force is created which is measured in units called volts. Whether any current flows or not the voltage is there.

The condenser consists in the water case of an elastic diaphragm "C" stretched across a cylinder, and in the electrical case of two conducting surfaces separated by a layer of insulating material "c." When a difference of pressure is created water is sucked out from one side and forced into the other side of the condenser, bending the diaphragm "C" to an amount depending upon the pressure and the elasticity of the diaphragm "C." If any path be provided for the water to get from one side to the other of the diaphragm "C" it will return to its normal position. Similarly, when a difference of potential is created, electricity flows out of one side and into the other side of the condenser "c," which becomes charged to an amount depending upon the voltage and the capacity of the condenser "c." If a conductor be connected to the two sides of the condenser "c" it will discharge itself.

The discharger consists in the water case of a sticky valve "D," and in the electrical case of a spark gap "d." When the pressure reaches a certain amount the valve "D" flies open (allowing free passage to the water), remains open a short time, and then falls back into its seat, where it sticks until the pressure is again sufficient to force it up. Similarly, when the voltage reaches a certain amount, the spark gap "d" breaks down (allowing a free passage to the current), remains conductive for a short time, and then becomes non-conductive until the pressure is again sufficient to break it down.

The primary inductance consists in the water case of a heavy piston "P" running in a cylinder, and in the electrical case of a coil of wire "p." When water flows it moves the heavy piston "P" which, owing to its inertia, is difficult to set in motion, or when in motion to stop. Similarly, when a current flows it creates in the coil "p" a magnetic field which is difficult to create, or if created is difficult to stop.

The secondary inductance "S" and "s" is similar in construction and function to the above.

The transformer or jigger consists in the water case of the two heavy pistons "P" and "S" joined by the spring "M," and in the electrical case of the two coils "p" and "s" joined by their common magnetic field "m." When the piston "P" moves, it compresses or extends the spring "M," which tends to move the piston "S." Similarly, when a current flows in the coil "p," it creates a magnetic field "m" which tends to produce a current in "s."

The aerial consists in the water case of a long elastic bulb "A," and in the electrical case of an elevated wire "a." When water flows into the bulb "A" it expands, producing a pressure tending to cause the water to rush out again. Similarly, when a current flows into the aerial "a," it becomes charged, producing a voltage tending to discharge it again.

The earth consists in the water case of a reservoir "E," and in the electrical case of the earth "e." The water flowing in and out of the bulb "A" is taken from or given to the reservoir "E," just as the current flowing in and out of the aerial "a" is taken from or given to the earth "e."

The Action.

Primary Circuit.—The propeller "G" produces a pressure tending to move the water which, being unable to pass the valve "D,"

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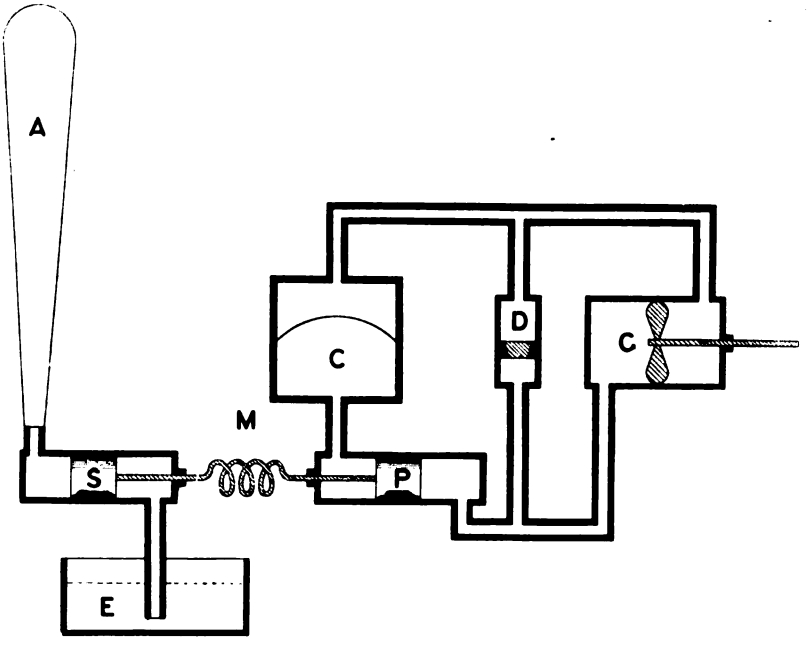
moves the piston "P" and deflects the diaphragm "C." The more the diaphragm "C" is deflected the greater becomes the difference of pressure between the water on the two sides, until at last it is sufficient to force the valve "D" open. When the valve "D" is open the water rushes through, allowing the diaphragm "C" to return to its normal position, but this rush of water has set the piston "P" in motion, and, owing to its inertia, it does not stop at its normal position, but passes it, pushing the water through the valve "D" and deflecting the diaphragm "C" in the opposite direction. Now the diaphragm "C" returns again to its normal position, setting the piston "P" in motion in the opposite direction, which in turn deflects the diaphragm "C" in the same direction as before. Everything is then exactly where it was when first the valve "D" was forced open, and this cycle of operations is therefore repeated again and again, causing an alternating flow of water and an oscillation of the piston "P." But, owing partly to friction in the pipes and mainly to the energy transmitted through the spring "M" to the other circuit (as will be further explained later), each oscillation is smaller than the previous one, and as soon as the water has become comparatively still the valve "D" falls back into its seat and sticks there until the propeller "G" again produces sufficient pressure to force it open.



Similarly the generator "g" produces a voltage tending to cause a current which, as it cannot pass the spark gap "d," charges up the condenser "c" and creates a magnetic field at "p." When the voltage becomes sufficient a spark jumps across the gap "d" and this path becomes conductive. When the spark gap "d" becomes conductive the condenser discharges through it, but the inductance at "p" causes the condenser "c" to charge up again in the opposite direction. Now the condenser "c" again discharges through the spark gap "d," causing a current to flow in the opposite direction through the inductance "p," which, in turn, charges up the condenser "c" in the same direction as before. Everything is then exactly as it was when the spark first occurred, and this cycle of operations is therefore repeated again and again, causing an alternating current and an oscillation of the magnetic field at "p." But, owing partly to the resistance of the circuit and mainly to the energy transmitted to the other circuit, each oscillation is smaller than the previous one, and as soon as the current has become comparatively small the spark gap "d" ceases to be conductive until the generator "g" again produces sufficient voltage to break it down.

The most important point to consider is the frequency of the oscillations. It is obvious that the more elastic the diaphragm "C"—the more easily it bends—the less forcibly will it set the water in motion. It is equally obvious that the greater the inertia of the piston "P" the less easily will it be set in motion. Hence increase of the elasticity of "C" or increase of the mass of "P" decreases the frequency of the oscillations of the water. Similarly, in the electrical case increase of the capacity "c," or of the inductance "p," decreases the natural frequency of the oscillating current in that circuit, or, in other words, increases the natural time period and wave length, the latter being actually proportional to the square root of the product of the capacity and the inductance.

Aerial Circuit.—If the piston "S" be moved along so as to cause a pressure in the elastic bulb "A," and if the piston "S" be then released, it is obvious from the foregoing that an oscillation will take place, the extra water being taken from or given to the reservoir "E." It is equally obvious that the frequency of the

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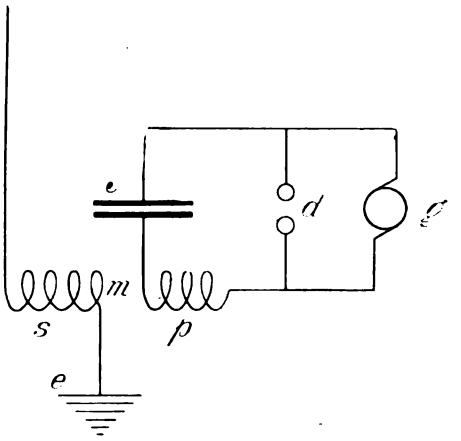
oscillations will depend upon the elasticity of the bulb "A" and the mass of the piston "S." Now, however, we encounter a new phenomenon. In the primary circuit the whole of the water was confined within pipes which were almost, if not quite, rigid, but in this aerial circuit we have an expanding and contracting bulb which affects the air around it. If the oscillations are sufficiently rapid a musical sound will be produced by the bulb, and conveyed by the air to a distant receiver such as the ear. The damping or dying down of the oscillations in this circuit, therefore, depends partly upon the friction in the pipes, but mainly upon the energy radiated or carried away by the surrounding air.

Similarly in the electrical case if the aerial "*a*" can be charged and left to itself, it will oscillate (taking its charge from the earth "e"), with a natural frequency depending upon the capacity of "*a*" and the inductance of "s," and the oscillations will rapidly die down owing to the energy radiated or carried away by the surrounding ether.

Coupling and Tuning.—The primary circuit with small internal losses and consequent persistent oscillations, and the aerial circuit with large radiation and consequent high damping, have so far been separately treated, and the effect of the one upon the other must now be considered. If the pistons "P" and "S" are coupled together by the spring "M," the oscillations of the piston "P" will tend to produce similar oscillations of the piston "S." If the natural frequencies of the two circuits are the same, the piston "S" will oscillate freely, but if the natural frequencies are different the piston "S" will scarcely oscillate at all. The reason for this is not far to seek. If the natural frequencies are the same, each impulse given by the piston "P" to the piston "S" will coincide with its natural movement, and therefore increase its swing until the energy radiated from the bulb "A" equals the energy supplied from the piston "P." If, on the other hand (to take an extreme case), the frequency of the primary circuit is double the frequency of the secondary circuit, then the first impulse given by the piston "P" to the piston "S" causes it to oscillate, but just as it is on its return stroke the second impulse comes, stopping it and destroying the work done by the first impulse.

In the electrical case, if the aerial inductance "s" is put so close to the primary inductance "p" as to be within its magnetic field, the oscillations in "p" will tend to produce similar oscillations in "s." If the natural frequencies of the two circuits are the same, the aerial circuit will oscillate freely, but if they are different the aerial circuit will scarcely oscillate at all. The process of making the natural frequencies of the two circuits the same consists of adjusting the inductance or capacity of either circuit until their product is the same as the product of the inductance and capacity of the other circuit. This process is called tuning.

The Object.—If two piano strings are strung up so as to have different notes, and both are subjected to a sudden gust of wind, both will



vibrate. But if both are subjected to a musical sound coming through the air from a distant transmitter only, the string having the same natural frequency as or being in tune with the received note will vibrate.

Before 1900 no primary circuit was employed. The only circuit of the transmitter was the aerial circuit, just as illustrated in the diagram, except that the valve "D" or spark gap "d" was in this aerial circuit. It has already been explained that this circuit has very great damping, consequently when the valve "D" flew open one violent impulse was transmitted to the surrounding air, followed by a few weak and rapidly dying down impulses. This gust affected all receivers almost equally, and in order to affect only one receiver (or, in other words, to obtain selectivity) it was necessary to replace this gust by a more sustained vibration.

A closed oscillation circuit is a persistent oscillator, but is not a good radiator, and Mr. Marconi's great invention consisted of coupling such a circuit to his old aerial circuit, which was a good radiator but a bad oscillator, and thus producing a system which radiated much more sustained oscillations. Further, he realised that the one essential for the satisfactory operation of this system was the employment of two circuits, having the same natural time period when oscillating independently.

Before this invention wireless messages had been sent, with difficulty, over a distance of 70 or 80 miles. Within a year of its introduction the Atlantic was bridged, and three messages were sent simultaneously from one station to another.

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The Human Element at a Wireless Station

Life at Crookhaven

By H. W. LEACH

IN a remote corner of County Cork, Crookhaven has suddenly sprung into an animated existence. This Irish village has no more than two hundred inhabitants, whose principal means of subsistence is fishing. The distance from Schull, which is the nearest point of approach to Crookhaven, is almost thirteen miles, but the surrounding country is wild and picturesque. Schull is some thirty miles from Skibbereen and is reached from the last-named place by means of a boat across the harbour, then a jaunting-car, which carries the traveller through some of the wildest, most rocky, and sparsely inhabited portions of south-west Ireland. Boating and fishing are available in the harbour, and provide the chief relaxations of the operators who are on duty at the Crookhaven Station. When this station was first erected in 1902 it was worked with a coherer receiver.

H. W. Leach.

There were at that date few sea-going vessels fitted with wireless apparatus, and the comparatively easy life of the operator on duty there in those days may be gauged from the fact that fifty messages from in-going and out-going steamers was considered a great feat. The actual telegraphic work was hardly sufficient to keep the operators busy at all times, but in following the developments in wireless telegraphy these operators were kept constantly interested. A change has, however, come over the place. The magnetic detector has been introduced, and Crookhaven has sprung into prominence as a wireless station. By reason of its geographical situation, all ships coming from the west and bound for a European port enter into communication with Crookhaven, and that station is busily employed, night and day, in sending and receiving messages. The life lived by the operators at this station is now a strenuous, albeit an interesting one. One incident, although it occurred nearly seven years ago, may be recalled as serving to show what was in the early days regarded as a welcome relief from the monotony of life in a station not busily employed. In 1904 an Atlantic liner, equipped with Marconi apparatus, broke one of her shafts some eighty miles out. Communication was at once set up between the station and the disabled liner, and over one hundred messages were cleared, the majority being to friends of the passengers in different parts of the world, and others summoning assistance, which was speedily rendered. For twenty-four hours the operators were busily engaged, and with the aid of wireless telegraphy the liner was ultimately enabled to continue upon her voyage. But times have changed; Crookhaven Station no longer waits for a chance event to stimulate activity, for the regular passage to and fro of steamers keeps the station incessantly engaged in receiving commercial and personal messages from those on board.

The life of an operator at Crookhaven differs greatly from the life of an operator at sea. There is little variety or excitement in the life, but the experience gained is both novel and interesting. The first impression on arriving at the village of Crookhaven is that the "end of everywhere" has been reached. But all sense of solitude vanishes before the pleasant and cheerful welcome received from one's colleagues, and the newcomer finds himself—for some time, at any rate—the centre of local interest.

There are usually six operators at this

The Village Square at Crookhaven

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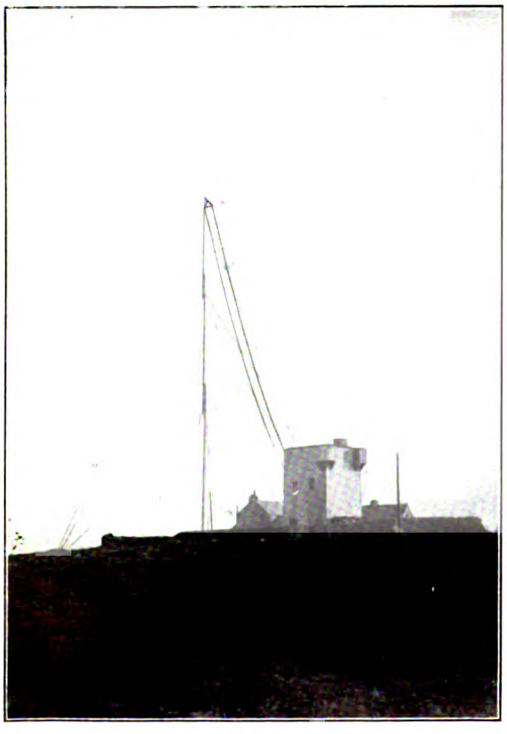
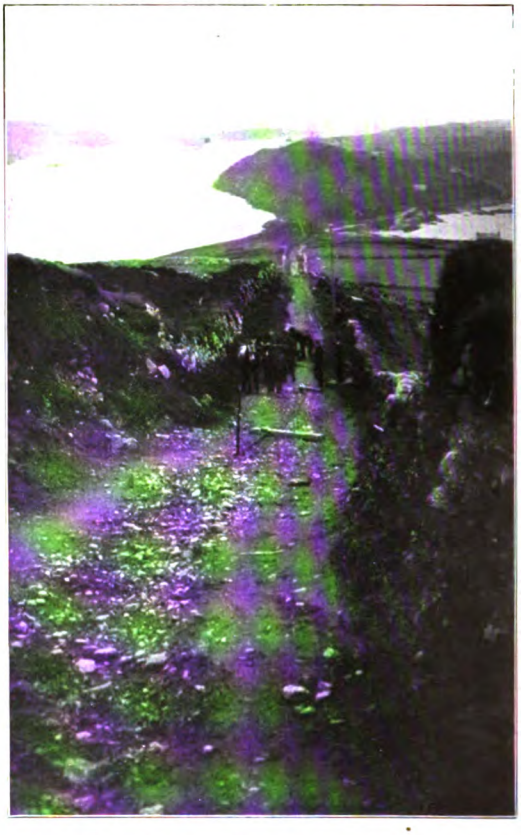
station. The day is divided into three watches, viz., midnight to 8 a.m., 8 a.m. to 4 p.m., and 4 p.m. to midnight, two operators being required on each watch. The daily routine proceeds with but little change. Every evening at about eleven o'clock the operators on the midnight to 8 a.m. watch prepare for their tramp to the station, which is a little over two miles from the village. The station stands on Brow Head, the most south-westerly point of Ireland, at an altitude of over 300 ft. The road from the village runs for some distance along the shore, then rises abruptly along the edge of the cliffs to the top of Brow Head. The absence of any signs of life on this road accentuates the encircling gloom. Rarely, if ever, is the solitude of the traveller broken by the chance meeting of a fellow creature; no light save that figuratively derived from the stars softens the blackness of the night, which is intermittently penetrated by the rays from the Fastnet Lighthouse, situated about seven miles off the mainland. At the station, however, the operator feels that he is again swept into the busy world. He will probably find that a dozen or more ships are in communication with the station, and will be kept busy sending and receiving messages from these ships. As Crookhaven is the first station



The Old Station at Crookhaven.



Road leading to the Village and Station.

with which the homeward bound American liners communicate it is naturally a busy station. By the aid of wireless all arrangements are made for the arrival of the ships, the landing and entraining of the passengers and mails, whilst hundreds of private messages to and from passengers are dealt with. Messages are also received from the Fastnet Lighthouse, which is fitted with wireless, reporting the passing of sailing ships and steamers. These messages are sent by vessels not fitted with wireless by means of signals to the Fastnet, thence by wireless to Crookhaven, whence they are forwarded to Lloyd's and to the owners of the vessels.

The tremendous advance made in wireless during the past few years is strikingly illustrated by a comparison of the present-day working at Crookhaven with that of earlier days. Some six or seven years ago it was quite unusual to be in communication with more than one ship at a time, and occasionally periods of one and even two days passed without any communications being handled. To-day, Crookhaven is always in communication

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Crookhaven Harbour viewed from the Old Station.

with at least six ships, and sometimes with as many as twenty. The operating is now carried on at over twice the speed and the distance of communication is greatly increased. Under these conditions the operator is kept busily engaged throughout his watch.

Although Crookhaven is a very quiet place, the life of an operator there is by no means uncongenial, and one's leisure can be spent in many enjoyable ways. The village is situated on a narrow peninsula, which forms a splendid natural harbour. In the summer this harbour provides good swimming and boating, whilst excellent surf bathing may be obtained in the many coves and on the strands along the shore. The inhabitants of the little village are genial, "homely" people, and are ever willing to lend their boats or to allow the operators to accompany them in their fishing-boats. In the winter, however, continuous bad weather frequently entails the cessation of all outdoor sport; the life then becomes somewhat monotonous and the daily journey to the station very trying. At such times any slight diversion is eagerly welcomed. The arrival of a wind-bound sailing vessel, a change in the staff, or other trivial occurrences are treated as matters of great importance and create much interest and excitement.

It is essentially a simple but healthy life that is lived at Crookhaven. Many of the conveniences and luxuries of the city are greatly missed; yet, withal, it is often with a feeling of regret that the operator leaves, and he generally takes with him many recollections of happy times spent at Crookhaven.

Wireless in the Italian Army and Navy

THE Italian Government have recently approved the establishment of the Royal School of Wireless Telegraphy. Senator Di Brochetti, who formed one of the Commission appointed to give effect to the Government's decision, in the course of an address, declared that wireless telegraphy had made remarkable progress during the last few years, especially in the matter of long-distance communication. In that progress, he added, honour had been shed upon his illustrious countryman, Signor Marconi, who had succeeded in solving the great problem of maintaining continual communication between ships at sea and land.

It was not so easy to understand the underlying principles and the application of wireless, which had become more complicated by the long ranges now obtained and the high powers used for this purpose, and which made it somewhat dangerous for operators who had not a perfect knowledge of the subject. To remedy this the Italian Government have been giving consideration to a Bill for the establishment of a Military Institute of Radio-telegraphy.

The principal objects of the Institute are: (1) Organisation of the radio-telegraphic service of the army and navy; (2) to afford the necessary general and special education to military and naval officers in order to familiarise them with the plant at radio-telegraphic stations; (3) to afford the means of making theoretical researches and experiments as regards the various systems of wireless transmission; and (4) to furnish to inventors, also to those who do not belong to the army, the opportunity of making experiments regarding inventions, provided that these experiments are considered by the permanent commission for wireless as being worthy of consideration for eventual improvement in the wireless service for the national defence.

The expense in connection with such an Institute will be divided between the army and navy in equal parts.

The sum of 25,000 lire will be devoted annually for the purposes of the Institute.

The administration and technical control of the Institute will be vested in a Commission consisting of a member of the Ministry, the Director-General of Artillery and Armaments, the Chief of the Institute, the Commander of the special battalion of Engineers, a Professor of Physics at the Royal Technical Academy, the Chief of the Wireless Departments of the Admiralty and Army, and an officer from each of these departments.

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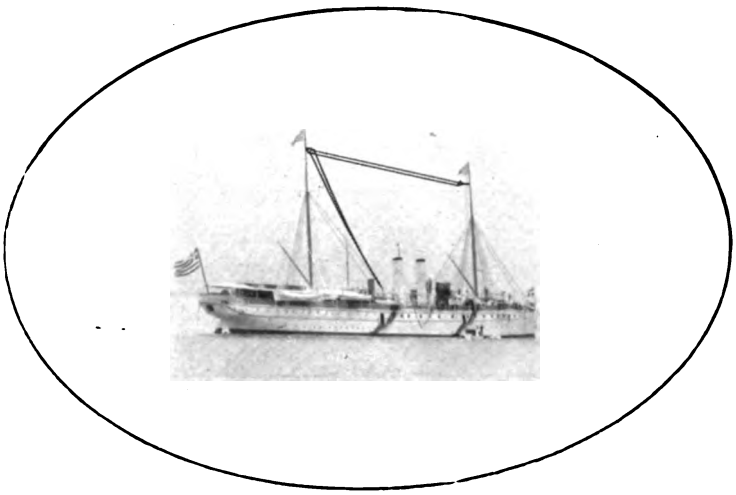
Maritime Wireless Telegraphy

NOTWITHSTANDING the fact that August is generally regarded as a quiet month for business, some important orders have been received by the various Marconi companies for the equipment of sea-going vessels. The French Company have received instructions from the Compagnie Generale Transatlantic to equip the SS. "Rochambeau." Our American friends, the Marconi Wireless Telegraph Co. of America, have just secured a notable order for the equipment of the cableship "Restorer" for the Commercial Pacific Cable Company.

The Marconi International Marine Communication Co., Ltd., have received instructions from the Compania sud Americana de Vapores to equip the SS. "Aysen," "Lemari," "Huasco," and "Palina." Instructions have also been received from the Union Steamship Company of New Zealand to equip nine passenger vessels and two cargo boats, among which are the SS. "Marama" and "Makura," and from George Thompson and Co. to equip the SS. "Demosthenes" and the SS. "Norseman." Among other orders received by the Company for 1½-k.w. and emergency plant up to August 17 were the following: The "Herefordshire" and the "Derbyshire" for Bibby Brothers; the "Princess Alice" for the Canadian Pacific Railway; the "Mendi" for Elder Dempster and Co.; "Pancras" and "Antony" for the Booth Steamship Co.; "Empress Queen" for the Isle of Man Steam Packet Co.; "Maloja" for the Peninsular and Oriental Co., and "Rotura" for the New Zealand Steamship Co.

The new Royal Mail steamer "Bayardo," which has been built by Earle's Shipbuilding and Engineering Co. for the Wilson line, was recently taken on her trial trip from the Hull Roads to within a short distance of Flamborough Head. The vessel is under the command of Captain Soulsby, and is intended for the Swedish mail service between Hull and Gothenburg. Her gross tonnage is 3,570 tons, and her horse-power 3,600, and she will be the fastest as well as the most sumptuously fitted vessel in Hull. Wireless telegraphy is fitted on the vessel.

To the lists of vessels in the course of equipment with Marconi apparatus given in previous issues of *The Marconigraph*, must be added the following: "Arethusa," boys' training ship lying off Greenhithe, "Remuera" (New Zealand Steamship Co.), "Vandyck" (Lamport & Holt), "Laconia" (Cunard Steamship Co.), "Rohilla" and "Rewa" (The British India Co.), "Somali," "Dongola," "Plassy," "Medina," "Ballarat," and "Bendigo" (The Peninsular and Oriental Steamship Co.), "Panama," "Victoria," "Mexico," "California," and two unnamed vessels, for the Pacific Steam Navigation Co.



The King of Greece's Yacht "Amphitrate."

A new record has been established by the Manchester Ship Canal, when the largest boat that has yet navigated the canal was berthed at Salford Docks. The steamer, which is named the "Argyllshire," arrived from Avonmouth, and is one of the Federal-Holder-Shire liners. The vessel is 547 feet long and 61 feet in breadth, and she has a displacement of 19,350 tons. She is to have a wireless telegraph installation.

King George's journey to India next November for the Durbar will be made on the

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ALL EASTERN PORTS. Frequent and Regular Sailings from and to LONDON, MARSEILLES and BRINDISI.

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PENINSULAR & ORIENTAL STEAM NAVIGATION CO.,
122, Leadenhall St., E.C., or Northumberland Av., W.C., LONDON.

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New Zealand, Tasmania & Australia

The Magnificent Royal Mail Steamers of this line are despatched every four weeks from **LONDON** to **NEW ZEALAND**, calling on the outward voyage at **Plymouth, Teneriffe, Cape Town** and **Hobart** (to tranship Australian passengers), and on the homeward voyage at **Monte Video** and/or **Rio de Janeiro, Teneriffe** and **Plymouth.**

Passengers booked to Teneriffe, Cape, and all Australian and New Zealand Ports.

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" Medina," a vessel which will be then on its maiden voyage.

The P. and O. Company have been called upon to make special travelling arrangements for the Indian Durbar. Although the sailings do not take place until November, the work of fitting out the two special ships is well in hand.

The " Medina " and the " Maloja " are both new vessels, and the former has been retained by the Admiralty for the Royal voyage to and from India. The " Maloja " will convey a large number of distinguished visitors to Bombay, and, as already announced, they are being fitted with Marconi wireless sets.

The King's ship will be painted white, with a ribbon of royal blue and gold. She will present a graceful appearance, and the arrangement of her upper decks and bridges will be imposing. The over-all length of the " Medina " is 560 feet, beam 62½ feet, moulded depth 38·3 feet. She has a displacement of 20,000 tons, and the gross register tonnage approaches 13,000 tons. The horse-power is to be 16,000, giving a speed of about 19 knots per hour.

When complete the Admiralty will take charge of the ship, and the naval crew, numbering some hundreds, will be under the command of Admiral Sir Colin Keppel. On the special mast will fly the Royal Standard, the rear-admiral's flag at the yardarm, the Admiralty flag on the foremast, the Union Jack at the mizzen, and the White Ensign aft on the quarter-deck.

The SS. " Espagne," belonging to the Compagnie des Transports Maritimes a Vapeur of Marseilles, which met with a mishap recently, was equipped with a wireless apparatus known as the " C. G. R." According to *La Liberté*, the radio-telegraphic apparatus on board would not work, and it was impossible for the vessel to make any communications at the time of the accident.

Wireless Records in the Pacific

Some good records were established by the wireless operator, Mr. Kearsley, during the passage of the R.M.S. " Zealandia " between Canada and Australia. On the up-trip the " Zealandia " was in communication with the Honolulu station for a distance of 1,100 miles, and at the same time linked up with Cape Flattery, on the Canadian coast, the total distance being 2,200 miles. During the down-trip she was in touch with Honolulu for 1,300 miles, and picked up Sydney 1,093 miles off. A message was received on the " Zealandia " from H.M.S. " Prometheus " at Vila, giving particulars of the mishap to the French mail steamer " Pacifique," and the news was transferred by Mr. Kearsley to Sydney. Off the coast the " Zealandia's " operator also received messages from the Adelaide S.S. Company's steamer " Grantala," which had just been equipped with wireless. The " Zealandia," it may be added, has a Marconi standard ship installation.

A wireless message received at Halifax, N.S., early last month, stated that H.M. cruiser " Cornwall " was ashore at Cape Sable, near the spot where the Canadian cruiser " Niobe " grounded on July 30th.

The wireless telegraph service established at Aden has been extended to ships, and communication between steamers at sea and Aden or Berbera is now open for the use of the public. Messages transmitted either to or from ships are charged at the rate of ten annas per word, and by arrangement with the Eastern Telegraph Co. at Aden, messages to and from ships at sea are accepted at or delivered from the Company's station, subject to a charge of eight annas for the first twenty words and four annas for every additional ten or part of ten words. We hope in an early issue to publish an account of these stations.

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Movements of Telegraphists

The following transfers have taken place during the past month:—

Mr. J. Gornall, from the "Lusitania" (2nd) to the "Pancras" (o.c.).

Mr. C. Allnutt, from the "Mauretani" (2nd) to the "Zeeland" (o.c.).

Mr. G. Gormlie, from the "Baltic" (2nd) to the "Leicestershire" (o.c.).

Mr. W. H. Knapman, from the "Empress of Ireland" (2nd) to the "Megantic" (2nd).

Mr. R. A. C. Lee, from the "Celtic" (2nd) to the "Virginian" (2nd).

Mr. H. Gibsone, from the "Megantic" (2nd) to the "Lake Champlain" (o.c.).

Mr. T. G. Petersen, from the "Hilary" (o.c.) to the "Cretic" (o.c.).

Mr. C. W. Perkin, from the "Ambrose" (o.c.) to the "Virginian" (o.c.).

Mr. F. White, from the "Lake Champlain" (o.c.) to the "Ambrose" (o.c.).

Mr. J. Bamford, from the "Virginian" (2nd) to the "Celtic" (2nd).

Mr. A. G. Blow, from the "Orcoma" (o.c.) to the "Romanic" (o.c.).

Mr. E. J. Day, from the "Campania" (2nd) to the "Devonian" (o.c.).

Mr. W. F. Atkinson, from the "Cedric" (2nd) to the "Empress Queen" (o.c.).

Mr. F. A. Bradley, from the "Laurentic" (2nd) to the "Ben-my-Chree" (o.c.).

Mr. W. H. Silvester, from the "Victorian" (2nd) to the "Merion" (o.c.).

Mr. G. W. Carmichael, from the "Franconia" (2nd) to the "Princess Alice" (o.c.).

Mr. L. C. Kinnear, from the "Oceanic" (2nd) to the "Minnetonka" (o.c.).

Mr. H. E. Horoy, from the "Menominee" (o.c.) to the "Mesaba" (o.c.)

Mr. E. G. Hill, from the "Majestic" (o.c.) to the "Oceanic" (2nd).

Mr. L. L. Jones, from the "Himalaya" (o.c.) to the "China" (o.c.)

Mr. A. E. Hill, from the "Ionic" (o.c.) to the Spanish Station at Barcelona.

Mr. J. B. Helders, from the "Batavier III." (o.c.) to the Spanish Station at Barcelona.

Mr. H. E. Earl, from the "Clifden" to the Spanish Station at Barcelona.

Mr. W. M. Craven, from School to the "Lusitania" (2nd).

Mr. F. R. Yoe, from School to the "Oronsa" (o.c.).

Mr. A. F. Burton, from the "Virginian" (o.c.); Mr. W. F. Storm, from the "Elmina" (o.c.); and Mr. F. L. Dennis, from the "Campania" (o.c.) have been granted sick leave, and are at present out of office.

Movements of Engineers
to Aug. 22

Mr. W. S. Entwistle left for Coltano on August 12th.

Mr. H. J. Round sailed on SS. "Laurentic" on August 5th with Mr. Marconi.

Mr. C. E. Prince has gone to Athens on special duty.

Mr. A. Flood-Page is at present at Poldhu on holiday relief until September.

Mr. J. Vincent, lent by the Belgian Co., is now attached temporarily to the merchant ship fitting staff.

Mr. H. F. Merton left Chelmsford on August 9th for Liverpool, where he is continuing his instructional course at the School of Telegraphy.

Mr. J. Hudson left Madrid on May 17th for England, on leave.

Personal

Mr. and the Hon. Mrs. Marconi left Liverpool on August 5 in the White Star liner "Laurentic" for Quebec and Montreal.

Mr. G. Marconi, LL.D., D.Sc., has been elected President of the Junior Institution of Engineers for the ensuing session.

Captain C. G. G. Crawley, R.M.A., has been appointed to the "Vernon," for experimental duties in wireless telegraphy, and Captain R. C. S. Waller, R.M.L.I., to the "Defiance," as instructor in wireless telegraphy, to date from date of embarkation.

Lieutenant S. C. Wace, R.M.A., has been appointed to the "Exmouth," as instructor in wireless telegraphy.

Mr. Arthur H. Brewster, of the London Office Staff of Marconi's Wireless Telegraph Co., Ltd., was married to Miss May Cumley, of Eastbourne, on August 12th. To mark the event the Directors of the Company and the staff in London presented Mr. Brewster with a handsome piano.

Appeal to the Benevolent

The following amounts have been received during the past month for the fund raised on behalf of Mrs. W. J. Croxon, whose husband died recently as the result of an operation for cancer:—Mrs. Murphy, 10s.; Mr. Stone, 15s.; "The Bungalow," £4 5s.; Mr. J. Willey, 10s.; Mr. F. J. Crowley, 5s.; Mr. G. E. Macaulay, 5s.; Mr. W. L. McEwen, 10s. Ten shillings was received from Mr. and Mrs. B. Pontifex during the preceding month. We would like to remind our readers that this fund is still open and that contributions should be addressed to the Editor of *The Marconigraph*, Watergate House, Adelphi, London, W.C.

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The Transmission of Telegrams to and from Ships at Sea

TELEGRAMS for transmission to ships equipped with Wireless Telegraph apparatus are accepted at nearly every telegraph office in the World Full information regarding routes, rates, etc., will be found in the British Post Office Official Guide, or may be obtained from any telegraph office or the offices of the Marconi Companies.

Messages may also be transmitted through the Marconi Companies' High Power Stations at Poldhu, England, and Cape Cod, U.S.A., to ships fitted with special receiving apparatus at any point on the North Atlantic, at a charge of 3s. per word.

WIRELESS MESSAGES MAY ALSO BE SENT TO CERTAIN SHIPS THROUGH THE FOLLOWING COAST STATIONS ABROAD—

ADEN.

ALGERIA.
Fort de l'Eau.

AUSTRIA.
Pola.
Sebenico.

AZORES.
Corvo.
Faval.
Flores.
S. Maria.
S. Miguel.

BELGIUM.
Nieuport.

BRAZIL.
Amaralina (Bahia)
Babylonia (Rio de Janeiro).
Fernando Noronha.
Olinda.

BRITISH GUIANA.
Demerara.

BURMA.
Diamond Island.
Table Island.
Victoria Point.

CHINA.
Tsingtau.

Cocos.

CORSICA.
Ajaccio.

DENMARK.
Copenhagen.

FRANCE.
Boulogne.
Brest.
Cherbourg.
Dunkirk.
Lorient.
Porquerolles.
Rochefort.
S. Maries-de-la Mer.
Ushant.

GERMANY.
Arkona.
Borkum.
Bülk.
Cuxhaven.
Norddeich.

HOLLAND.
Scheveningen Haven.

INDIA.
Bombay.
Calcutta.
Jask.
Sandheads.

ITALY.
Asinara.
Bari.
Capo Mele.
Capo Sperone.
Cozzo Spadaro.
Forte Spuria.
Monte Cappuccini
Monte San Giuliano.
Naples.
Palermo.
Palmaria.
Ponza.
Reggio.
S. Maria di Leuca.
Venice.
Viesti.

JAPAN.
Choshi.
Fukkikaku.
Osezaki.
Otchishi.

JAPAN *contd.*
Shiomisaki.
Tsunoshima.

MEXICO.
Cerritos de Sinaloa
S. Jose del Cabo.
S. Rosalia de la Baja California.

MOROCCO.
Casablanca.
Mogador.
Rabat.
Tangiers.

NORWAY.
Flekkerö.
Röst.
Sörvaagen.
Tjömö.

PACIFIC ISLANDS.
Angaur (Palaos Islands).
Jap (or Yap) (Caroline Islands).

ROUMANIA.
Constantza.

RUSSIA.
Nicolaiewsk.
Petropavlovsk.

SARDINIA.
Maddalena.

SENEGAL.
Dakar.
Port Etienne.
Ruhsque.

SOMALILAND.
Berbera.

SOUTH AFRICA.
Cape Town.
Durban.

SWEDEN.
Karlskrona.

URUGUAY.
Cerro de Montevideo.
Punta del Este.

WEST INDIES.
Curaco.
Jamaica.
Tobago.
Trinidad.

ZANZIBAR.
Zanzibar.
Pemba.

Passengers on board ships fitted with the Marconi system may obtain from the enquiry office on board, or from the Marconi Operator, full particulars regarding the despatch of messages to all parts of the world.

Any further information required will be willingly supplied on receipt of a request addressed to any one of the following Marconi Offices—

LONDON . . .	The Marconi International Marine Communication Co., Ltd., Watergate House, York Buildings, Adelphi, W.C.
BRUSSELS . . .	La Cie de Telegraphie sans Fil, 19 Rue du Champ de Mars.
PARIS	La Cie Francaise Maritime et Coloniale de Telegraphie sans Fil, 35 Boulevard des Capucines.
BUENOS AYRES .	La Cia Marconi de Telegrafia sin Hilos del Rio de la Plata, 132 San Martin.
MADRID	Cia Nacional de Telegrafia sin Hilos, Calle de Alcala 43.
MONTREAL . .	Marconi Wireless Telegraph Co. of Canada, Ltd., 86 Notre Dame St.
NEW YORK . .	The Marconi Wireless Telegraph Co. of America, 27 William Street.
ROME	Marquis L. Solari, Piazzi S. Silvestro, 74.

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French News

FOG SIGNALS.—The Ministry of Public Works have decided to equip the lighthouses at Créach and at the Isle of Sein on the Coast of Brittany with radio-telegraphic apparatus for communicating with ships in foggy weather.

WIRELESS AEROPLANES.—Second Lieutenant Menard and Captain Brenot, of the French Army, have ascended from Saint Cyr on a biplane fitted with wireless telegraph apparatus. Evolutions were carried out at a height of nearly six hundred yards over Rambouillet, which is over thirty miles from the Eiffel Tower, and a wireless message was sent to the receiving station at the Tower, whence it was re-transmitted to the War Ministry. The wireless apparatus employed on this occasion weighed twenty-one kilogrammes. The spark which set up the waves was generated by a magnetic appliance actuated by the aeroplane engine. The experiments are considered decisive, and it will henceforward be possible for officers of the air squadrons to report immediately to headquarters the discoveries made by them with the aid of the aeroplanes.

Lieutenant Conneau ("Beaumont"), the winner of *The Daily Mail* £10,000 prize, has given some interesting views to the London correspondent of the *Temps* on the employment of aeroplanes in the Navy. Lieutenant Conneau is of the opinion that every cruiser should be equipped with an aeroplane to act as a scout, having a special platform for the starting and landing of the flying machine. Lieutenant Conneau sees the possibility of fitting the naval scout's machine with wireless apparatus, so that he may be in constant touch with his ship.

MESSAGES FOR EIFFEL TOWER.—The Eiffel Tower is making progress in wireless communications. It is now in connection with Fez, viâ Oran. Four years ago wireless field posts were established with the army at Casablanca. A post of moderate power has been established at Fez, which soon got into communication with the wireless posts at Oran. Thence the connection with the Eiffel Tower is easy, and several messages have already been sent and received.

Canadian Boy Scouts' Message from Mid-Atlantic.

The detachment of Canadian Boy Scouts who came over to take part in the Coronation celebrations sent a Marconi message on their homeward journey on the Canadian Northern R.M.S. "Royal George," addressed to Captain Grenfell, upon whose ground they were encamped at Roehampton, Barnes. The wireless message was in the following terms:

"We, the Canadian Boy Scouts, homeward bound, send our heartiest thanks for all kindness extended to us. Have had glorious time. Assembled on deck of 'Royal George,' have just given three cheers for King George, Queen Mary, and Royal Family, also for the Chief Scout, and Captain Grenfell, and brother scouts in Great Britain."

One of the most novel features of the Electrical Exhibition, which opens at Olympia, London, in September, will be the Marconi Company's installation of wireless telegraphy, which will enable anyone to transmit a message from the ground floor to the gallery free of charge. In order to cope with the great demand which is sure to be made, a strong staff of operators will be present throughout the Exhibition. The fond lover whose lady has been separated from him temporarily will find the department an excellent means of locating her whereabouts.

William A. Dibell, treasurer of the United Wireless Telegraph Co. of America, was liberated from jail on payment of a fine of $2,000, although he had been sentenced to one year's imprisonment. Since his conviction he and four other officers of the company—among them Christopher Columbus Wilson, its president—have been in the Tombs, unable to get bail.

A message by wireless telegraphy was sent to Sir Wilfrid Laurier during his return journey from England to Canada on behalf of a woman lying under sentence of death in Canada. The woman's execution had been deferred, but, whilst granting this respite, the Canadian Government declined to issue a reprieve. A petition for presentation to Sir Wilfrid Laurier was prepared by the Women's Social and Political Union, and the Canadian Premier was communicated with by wireless, apprising him of the petition.

The War Office have been carrying out wireless telegraphy experiments near Dorking. The trials have proved highly satisfactory.

A wireless message received at Boston on August 17th stated that the Donaldson liner "Saturnia" collided with an iceberg 175 miles east of Belle Isle on the previous day, but was proceeding. The message asked for the Donaldson liner "Cassandra" to communicate with her. Communication was made with other vessels, and the "Saturnia" was eventually brought to Greenock for repairs.

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THE MARCONIGRAPH

No. 7. October, 1911. Subscription, 3/- per annum, post free. Price 2d. Post Free 3d.

Wireless Telegraphy in the Falkland Islands

GREAT importance attaches to the decision to erect a 5-kw. wireless station in the Falkland Islands, an order for this having been placed by the Crown Agents for the Colonies with Marconi's Wireless Telegraph Co., Ltd. The Falkland Islands are a group of islands, the only considerable cluster in the South Atlantic Ocean, about 300 miles east of the Strait of Magellan. Port Stanley, on East Falkland, is the chief settlement, and it is here that the wireless station will be situated.

The installation will have a working range of 400 nautical miles over water, and a maximum range considerably exceeding the above figure. It will be arranged to tune in transmission to waves of 300 and 600 metres, and to any waves between 600 and 1,200 metres, and in reception to any waves between 100 and 2,500 metres. Two sectional steel masts, with wooden topmasts, each 220 feet in height, will be provided, the aerial system consisting of a two-part aerial of the "T" type. The prime mover will comprise a horizontal slow-speed electric-light type oil-engine of 15 b.h.p., driving by belt an alternator and direct-coupled exciter, to which will be coupled an alternator. This combination is to be arranged to drive a disc discharger direct from an extension of the shaft.

The transformers will be of the single-phase, closed iron-core type, oil cooled, contained in galvanised steel cases, and provided with suitable high-tension ebonite bushed terminals. In conjunction with the transformers, suitable oil-cooled iron-core primary low-frequency inductances will be provided. Provision will be made against injurious induced effects from the high-frequency circuit by air-core protecting chokes. The condenser battery will consist of eight independent whole glass-plate Foldhu type condensers. The disc discharger will be designed for producing a musical note in transmission, and will consist of a steel disc, with transverse copper studs rotating between adjustable revolving electrodes. The disc will be direct coupled to the alternator. The solenoid type of high-frequency primary inductance will be of ample dimensions, continuously adjustable over the full range of inductance required for varying wave-length between the stops of the condenser combination, so as to provide for the waves specified. The transmitting jigger will be of the independent primary and secondary circuit type, contained in teak cases, the secondary being adjusted laterally with respect to the primary for varying the coupling between the circuits.

The receiver will consist of the one part of a double magnetic detector and multiple tuner providing for the reception of all waves between 100 and 2,500 metres, the multiple tuner being calibrated to permit the instrument to be set to any pre-arranged wave-length to be received, and provided with a change switch to permit of instantaneous change of the circuit from a highly syntonised tuned condition to an untuned condition specially devised for picking up incoming waves of widely different wave-length when standing by. The receiving circuit will be arranged so that it may be permanently connected to the aerial through the insulated plate of the earth arrester terminal, thus permitting the operator to be interrupted in the transmission of a message in the event of erroneous reception by a corresponding station. The receiver will consist for the other part of a valve receiver of generally similar construction to the above combination, except that the valve detector and the wave-length in reception will be from 1,600 to 4,000 metres.

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COMMENDATORE TOMÁS AMBROSETTI

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Commendatore Tomás Ambrosetti

President of the Compania Marconi de Telegrafia Sin Hilos del Rio de la Plata

THAT paralysis of Hamlet's will which followed when the evidence of two worlds hung in equipoise before him no one can possibly understand better than he who attempts to pen a fitting appreciation of a man nurtured in a distant clime—an honourable victor in spheres remote from the writer. The object of such a sketch should be to focus—

> The man, his aims, his daily irk,
> His troubles, trials, thoughts and views.

How impossible of achievement such a task is without personal acquaintance is sadly manifest in the task to portray the subject of our biography this month.

Tomás Ambrosetti was born in Vatellina, in Northern Italy, seventy-seven years ago. At the immature age of twenty he obeyed the call of the West, and left the land of his fathers to fight the battle of life in Argentina. A survey of his achievements in the world of commerce and of his philanthropic work redound to the credit of the man who is acclaimed in two hemispheres not only as a sound, sober, and successful man of business, but as a pioneer of philanthropy in the land of his adoption. For Tomás Ambrosetti was not turned by the incessant claims of business from the needs of his fellow-countrymen who were less successful in life than he has been. Indeed, he has always been a leading factor in all works of charity and patriotism concerning Italian residents in the Argentine Republic, and it is largely due to his efforts that several charitable institutions exist in that country. The teaching of the ancients that "a beneficent soul will be abundantly gratified" may well be applied to Mr. Ambrosetti, who can look back with pride upon his unselfish labours. Yet the man who has contributed so liberally by means of his talent and his purse has always occupied a leading position in the social and commercial life of Argentina, in which country he was the originator of important transport and insurance companies. He was President of the Buenos Ayres Western Railway, also President of the Italian Chamber of Commerce in Buenos Ayres, which has been the principal factor in the prosperous commercial relations which now exist between Italy and the Argentine Republic. There is little reason to wonder that a man of such acute judgment and proved ability should appreciate the possibilities of wireless telegraphy, and he is now president of the Marconi Company in Argentina (Compañia Marconi de Telegrafia Sin Hilos del Rio de la Plata). He is also president of the insurance company America, and is vice-president of the Banco de Italia y Rio de la Plata.

The services which Mr. Ambrosetti has rendered have been gratefully appreciated in his native country, where he has been appointed a Knight Commander (Commendatore) of the Order of the Crown of Italy.

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Imperial Telegraphic Communication

The Marconi Epic

By J. HENNIKER HEATON

[*Mr. J. Henniker Heaton has done so much during his life to further and facilitate communications between different parts of the British Empire and different parts of the world that he has deserved and gained world-wide fame. Born at Rochester in* 1848, *he was educated at Kent House Grammar School and King's College, London, of which he is a Fellow. In* 1885 *he was elected Member of Parliament for Canterbury, a seat which he held continuously for twenty-five years. He retired at the last dissolution on account of ill-health, to the great regret of his constituents and his colleagues in Parliament, men of all parties sharing in their admiration for and esteem of this valiant reformer. He has all along been a strenuous advocate of Postal Reform, and initiated many reforms, among them being telegraphic money orders, parcel post to France, Imperial Penny Postage, Penny Postage with the U.S.A., etc. The freedom of the City of London (in gold casket) was conferred upon Mr. Henniker Heaton in* 1899, *in which year he was similarly honoured by the city of Canterbury (in silver casket and oak from Canterbury Cathedral). In August of this year he was honoured by Australian bankers.*]

THE Imperial Conference, held in London earlier in the year, has served to give the citizens of the British Empire another opportunity of gauging the relative importance of cheap communications in the consolidation of the Empire. At this conference, however, another factor was introduced in the form of wireless telegraphy, which was discussed for the first time with an element of reality in the Imperial Council of the Empire. Signs are not wanting that the discussions will bear fruit ; at all events, the development of wireless communications among the various units of the Empire will have important social, commercial, and political results. Before considering that aspect, however, a word of acknowledgment may be permitted to the retiring worker and inventor, who has manifested himself by his beneficent discovery.

The Boyhood of Marconi.

Guglielmo Marconi was born at Villa Griffone, near Bologna, in 1874, and was educated at Leghorn, under Professor Roser, and at Bologna University, under Professor Righi. At the early age of four or five budding invention displayed itself, to the dismay of his mother, in the manufacture from wild berries of an excellent ink, so excellent that his white summer clothes were permanently " marked," for which feat he was scolded. In 1888 the late Professor Hertz demonstrated that a disruptive (spark) discharge of electricity causes electromagnetic waves to radiate in all directions through the ether, exactly as waves radiate where a stone falls in still water. The Hertzian waves travel with the same velocity as light, and would go eight times round the world in a second. With like rapidity the idea of utilising them darted through the minds of many students of electricity, among others young Marconi. But little progress was made. The problem was a double one—how to transmit energy to a distance, and how to devise a receiver sensitive enough to be affected by it. The cable company shareholder, who had trembled at Hertz's discovery, smiled as year after year rolled by without practical application of it. So far back, indeed, as 1844 Professor Morse had telegraphed without wires under the Susquehanna River ; and in 1854 that remarkable genius, the late James Bowman Lindsay, whom, like the Ayrshire Genius of Song, Scotland sadly neglected, patented an invention for telegraphing through water without wires. He actually sent a message two miles. It is pleasant to note that Mr. Marconi early made a pilgrimage to Dundee in token of homage to this humble man of science, who had died before his brilliant successor was born.

Early Experiments.

Meanwhile, Marconi had been working indefatigably, with one device after another, on his father's estate, and in 1895 he attained complete success, and at once patented his invention in Italy. Dr. Slaby says in his work : " Marconi . . . has thus first shown how . . . telegraphy was possible." In May, 1896, the inventor came to England, and took out a patent (No. 12039 of 1896), a similar

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patent being secured in the principal foreign countries. Mr. Marconi, at the House of Commons, telegraphed across the Thames, 250 yards. In June, 1897, he covered nine miles; in July, twelve miles; in 1898 (to France), thirty-two miles; and in 1901, 3,000 miles. In view of the recent brilliant achievements in actual commercial working it is rather interesting to recall these early successes. In 1898, during the confinement of the late King Edward, then Prince of Wales, to his yacht through an accident, communication was maintained between the Prince and his Royal mother at Osborne by means of the Marconi apparatus. We can picture at this dim distance the venerable sovereign, towards the close of a long reign that had witnessed so many vicissitudes and perils, due to the widely scattered nature of her dominions, conscious that she was bequeathing to her successor an Empire of inconstant waves, one that hung, as in 1805, on the maintenance of communication with a distant admiral; we can picture her, I say, looking out on the sea for the first time without fearing it, with a full and grateful heart, and a kindly thought for the young inventor who had pointed the trident of Britannia with electric fire! That the late King Edward, too, was deeply interested by the almost magical powers of Marconi is evidenced by the fact that, towards the end of his all too brief reign, he spoke to me enthusiastically of the modest young inventor, and said, in the course of conversation, that wireless telegraphy was one of the most wonderful and potent influences of the age.

Photo.] *Mr. J. Henniker Heaton.* *[Elliott & Fry*

An Interesting Incident.

There is no need for me to refer here to the almost incredible progress which has since been made, and to the commercial success of Marconi's Wireless Telegraph Co., under whose ægis stations have been erected in different parts of the world, and vessels of all descriptions use the system. Helpless, disabled, driven into remote seas, the mariner feels that he is never out of reach of sympathy and aid. Business is now directed from mid-ocean, and people afloat brought into touch with friends ashore. One or two interesting incidents in what one may call the Marconi Epic may, however, be alluded to. What figure in the "Æneid" is more heroic, in the classical sense, than that of the silent young scientist, sitting at noon on December 12th, 1901, in a room at the old barracks on Signal Hill, near St. John's, Newfoundland? By arrangement, his assistants at the Poldhu station in Cornwall were to telegraph across the Atlantic the letter "S" on the Morse code, represented by three dots, for certain hours each day. On the table was the sensitive receiving apparatus, supplemented for the sake of absolute certainty by a telephone receiver. A wire led out of the window to a huge kite, which the furious wind held 400 feet above him. He held the telephone receiver to his ear for some time. The critical moment had come for which he had long laboured, for which his 300 patents had prepared the way, for which his company had erected the costly station at Poldhu. His face, watched by his assistant, showed no sign of emotion. Suddenly there sounded the sharp click of the "tapper" as it struck the coherer, showing that something was coming. After a short time Mr. Marconi handed the telephone receiver to his companion. "Can you hear anything, Mr. Kemp?" "A moment later," says the writer of a picturesque account of this scene, "faintly, and yet distinctly and

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unmistakably, came the three little clicks, the dots of the letter 'S,' tapped out an instant before in England." The victory over ocean and space and Nature was won!

Rival "Inventors."

Stimulated into envy by the brilliant success of Marconi, a score of utterly unscrupulous men, German and American chiefly, entered into competition with rival schemes and sought to deprive him of the just claim to which he was entitled. But the admirably lucid judgment of Mr. Justice Parker in some recent litigation has finally disposed of any doubt as to whom is due the credit for making wireless telegraphy possible on its present large scale. And in this respect it is worth while recalling the words of the American Judge Townsend in a patent action some six years ago:

It would seem therefore to be a sufficient answer to the attempts to belittle Marconi's great invention that, with the whole scientific world awakened by the disclosures of Hertz in 1887 to the new and undeveloped possibilities of electric waves, nine years elapsed without a single practical or commercially successful result, and Marconi was the first to describe and the first to achieve the transmission of definite intelligible signals by means of these Hertzian waves.

One or two considerations as to the probable influence of wireless telegraphy on the future of our race may be permitted. In the first place, it will tend to bind the different links of Empire and cheapen and facilitate communication between the Mother Country and the Dominions overseas. Cheap communication is the key to all the really momentous problems that confront our statesmen and merchants, and any advance in that direction is to be hailed with rejoicing. This is fully appreciated by Mr. Marconi, who wrote to me about four years ago as follows:

For many years I have taken the deepest interest in the splendid Postal and Telegraphic Reforms which you have been instrumental in introducing. I sincerely hope that the good work to which you are now devoting your efforts may be crowned with complete success, and that before long your desire to see a service of penny telegrams to New Zealand may be realised by the help of wireless telegraphy.

The Future.

That this was no idle statement is well attested by achievements which stand to the record of the Marconi Company, and which lead me to realise the truth of the remark made to me some time ago by Sir Joseph Ward, that the rapid improvement made in Marconi wireless telegraphy can only lead to the attainment of cheap telegraphic communication. Ships equipped with Marconi apparatus cross the oceans in complete touch with the world they have left. From Cornwall to Cæsar's country, from Cornwall to the North of America, wireless messages flash in the twinkling of an eye. The world watches Marconi as one of the gifted leaders born for our time. His system is a powerful factor in our crusade for cheap Imperial communications.

Henceforth a severance of communication with any part of the earth will be impossible. Storms that overthrow telegraph posts and malice that cuts our cables are impotent in the all-pervading ether. From the tropical forest or the ice fields; from the seat of war or the centres of peace and of commerce, daily progress will be reported. The long-distance traveller will be able to obtain the current news of the day while on the high seas; every wandering tramp steamer will have its wireless aerial, and will be in constant touch with the vessels that dot the ocean all about it. Hitherto the cost of wires has kept the blessing of cheap telegraphic communication from the bulk of mankind. The Marconi Company, however, have shown that this need no longer stand in the way, and they are bringing us nearer and nearer the ideal instantaneous electrical communication with every man on earth, ashore, or afloat at a cost within the reach of everyone.

A novel prosecution characteristic of the progress made in recent years is reported from Los Angeles, California, where a newspaper editor has been arrested on the charge of publishing a stolen wireless message. The message was sent from Los Angeles to Mr. Peard, editor of the *Los Angeles Herald*, who was holiday-making at Avalon, and was intercepted by some amateur wireless operators. Three young men who were experimenting with the Marconi apparatus picked up the message on its way to Avalon, and, scenting a new story, took it to Mr. Earl, editor of the *Los Angeles Tribune*, who published it without asking questions. General Otis, the sender of the message, who has been waging a bitter newspaper war on the *Tribune*, promptly secured the arrest of Mr. Earl, against whom a formal indictment was returned. There was some argument on the technical point as to whether the message could be called "stolen," as it was contended on behalf of Mr. Earl that messages sent through the air which could be read by anyone possessing a receiver could not be called private or copyright. There is no case to go upon for "tampering with United States mails," for the message was not dispatched by a Government operator. Mr. Earl has been released upon bail, and the case is being watched with the greatest interest by newspaper proprietors and people owning private wireless apparatus.

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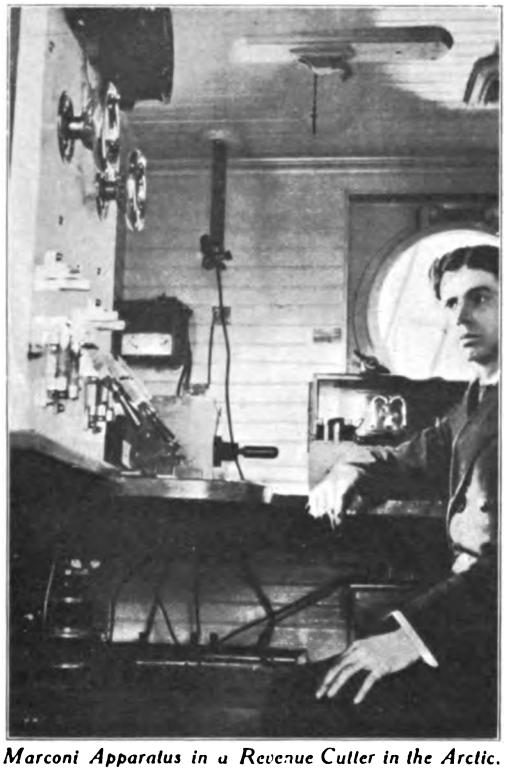
In the Arctic Circle

AN appreciation in a San Francisco newspaper of THE MARCONIGRAPH has brought us an interesting letter from Mr. C. T. Furbourg. This gentleman was chief electrician on the United States Revenue Cutter "Beau," which has just returned from a cruise to Point Barrow, Alaska, and the Arctic



Marconi Apparatus in a Revenue Cutter in the Arctic.

Ocean. A point of interest is that at the time of writing the "Beau" was the only vessel that had ever entered the Arctic Circle equipped with wireless apparatus, a Marconi 2-kw. set being installed on the cutter and working very successfully. The Arctic Circle is a circle drawn round the North Pole at a distance of 23½°. The corresponding circle round the South Pole is called the Antarctic Circle. Within these two circles the sun sometimes does not rise for days, weeks, or even months; and at the poles the days and nights are alternately of six months' duration. At the time of the visit of the "Beau" to the Far North there was continuous daylight, and, as has already been intimated, the Marconi apparatus worked with complete satisfaction under those conditions. The "Beau" was built at Greenock, in Scotland, in 1874.

Wireless in Alaska.

REPRESENTATIONS are to be made to the Dominion Government urging the extension of the wireless telegraph systems to several of the out-of-the-way posts of the Yukon. Bishop Stringer, of Dawson, who is well known in that city, will, it is said, soon take the matter up with officials at Ottawa. The residents of the north are desirous of linking up Herschell Island, Fort MacPherson and Rampart House with Dawson. By this method Bishop Stringer believes that these outlying places will be robbed of much of their isolation, and the country in general wonderfully benefited. If plants are established at the three places, an active campaign will follow for the equipping of other of the far-away places with wireless apparatus so that they can keep in touch with the different large centres in the Yukon. Everyone in the north is interested in the movement, and it is expected that within a very short time strong recommendations will be sent to the federal capital asking for the installing of plants at the different places. By this method Bishop Stringer believes that the small settlements of the north will not have to undergo such terrible privations as is sometimes the case, as word of their condition may be flashed to Dawson or some other place and assistance sent. It would be a material help, too, in the work of administration. The stations would be of the greatest benefit to the north, and, it is believed, would be the means of causing an influx of people.

Wireless in Africa.

ITALY is connecting itself with its African colonies by means of wireless. Stations already exist at Massowah and Mogadiscio, which bring the two colonies into communication. Communication with the Motherland, however, has hitherto been wanting. This will be remedied by making a big installation at Coltano, near Pisa (referred to in the August issue of THE MARCONIGRAPH), which will communicate with Massowah. The distance from Coltano to Massowah in electric wave transmission is 2,500 miles. The distance measured in the same way between Massowah and Mogadiscio is 1,120 miles. Once the message has reached Mogadiscio it can be transmitted all over the colony, as there are substations at Brawa, Giumbo, Itala, Lugh, Merca and Bardera. The Coltano station will be able to communicate not only with Clifden in Ireland, but with Glace Bay in Canada, to say nothing of Monte Video, etc.

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The Operating Side of Wireless Telegraphy as a Career

By CALCHAS

SOON after Mr. Marconi's early and wonderful demonstrations of his inventions whereby telegraphic communication was established between places a distance apart without employing conducting wires, the writer became greatly interested in the operating side of wireless telegraphy, and well remembers spending hours searching through electrical papers, daily papers, and magazines to acquire information touching upon the new and special means of communication. (Unfortunately there was no MARCONIGRAPH published in those days.)

From many inquiries received by the Company from time to time it is evident that there are still many young men anxious to acquire information regarding the operating side of wireless telegraphy as a career, and it is for their special benefit that it has been decided to publish this article.

Before Mr. Marconi's invention communications between ships and the shore, or between ship and ship, could only be maintained over short distances by means of flag signals during daylight and the Morse signal lamp at night. Now, by means of the Marconi system, communication can be maintained over hundreds of miles. Wireless telegraphy has become as indispensable to ships for communication as the ordinary land line telegraphs are to the working of our railway systems, and as no railway station or signal-box is without its telegraph instruments, so it is safe to predict that in the near future no ship will be without its wireless telegraph installation. This invention has created a new type of telegraphist, known as the "Marconi operator." At the present time there are several hundreds of these operators, with a growing demand for skilled men.

The usual questions asked by applicants when seeking employment on the operating staff may be grouped under the following three headings:

1. What are the qualifications which it is necessary to attain in order to become a wireless operator?

2. What are the duties of an operator and the conditions under which he works?

3. What are the remuneration and prospects of advancement?

With regard to question No. 1, applicants for service on the operating staff of the Marconi companies should be not less than 21 years of age, nor more than 25 years. Those with previous experience in inland or cable telegraphy are preferred, although men who have been trained privately or otherwise have

Mr. F. Jones, Wireless Instructor at the Marconi Company's Liverpool School.

been from time to time accepted after passing certain tests. It is essential that an applicant be able to send and receive at the rate of not less than 25 words per minute on the Morse key and sounder. A knowledge of magnetism

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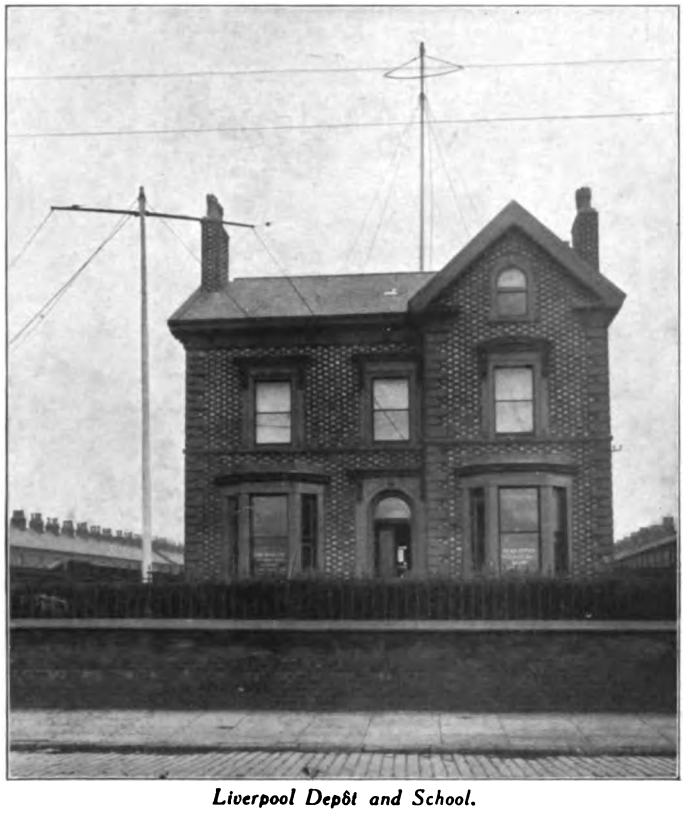

Liverpool Depôt and School.

and electricity is also necessary. Ordinary educational attainments are taken for granted, and a knowledge of foreign languages is an advantage. Each applicant approved by the Company is sent to the Company's Liverpool school for a course of instruction in wireless telegraphy, which prepares him for the examination held by the Postmaster - General, who issues the Government's certificates of competency to successful candidates.

The course of instruction in the school comprises:

(A) Elementary electricity and magnetism.

(B) Fundamental principles of wireless telegraphy.

(C) Transmitting by practice buzzer sets and receiving by telephones as used in wireless.

(D) The various pieces and types of apparatus used, and diagrams of electrical connections thereof.

(E) The connecting up of various parts comprising complete sets; how to trace and remove faults and repair breakdowns.

(F) Rules and regulations laid down by the Radiotelegraph Convention for the commercial working of wireless telegraphy.

(G) Clerical work in connection with telegraphic accounts and returns.

(H) General routine and discipline on board ship.

After completing the course of instruction and passing the Company's and the Government examinations, the operator is sent to sea, generally as second operator, before being placed alone in charge of an installation on board ship.

A wireless operator on board ship is signed on the ship's articles as a member of the crew, generally with the honorary rank of a junior officer, and is subject to the disciplinary regulations of the ship. He has to sign the ship's articles a day

Superintendent's Office.

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or days before joining, attend the Board of Trade muster and doctor's inspection, and perform any other duties of the routine character.

On ships carrying two operators a continuous watch is maintained, but on ships carrying one operator the hours of duty are long and irregular. This is compensated by little duty in port. Very good accommodation, food, and attendance are provided, and the operator has nothing to do other than attend to the wireless business, excepting under special circumstances. The operator, being a member of the crew, and having duty to attend to, does not associate with the passengers on board, but, provided he behaves himself, his surroundings are very pleasant, and he is treated with every consideration. When in foreign ports leave can be obtained from the captain to go ashore, and there is plenty of opportunity of seeing the various countries.

With regard to remuneration, the rule adopted is that every operator commences as a junior. The scale of pay is slightly higher than that paid to telegraphists in the home Government and cable services, and much higher than that paid to railway telegraphists; also the pay is increased more rapidly.

Operators joining the Company have of necessity to serve some years at sea before there is a likelihood of obtaining shore appointments. The maximum scale of pay for a senior operator is 55s. per week, with all found on board. Beyond this there are positions as travelling inspectors, with a special pay; also there are special appointments which become vacant from time to time in various parts of the world, and which carry good salaries. Operators doing good work and fitting themselves for such positions are, when opportunity arises, transferred to the engineering staff. Promotion is entirely dependent upon ability and good conduct.

Lecture and Class Room in the Liverpool School.

From the preceding it will be seen that the operating side of wireless telegraphy is not a "blind alley" career, and even should an operator leave the service after a few years he will find that the time spent was not wasted, but that, on the other hand, it was a career and an education combined.

An operator's life is both varied and interesting, as there are all sorts of special appoint-

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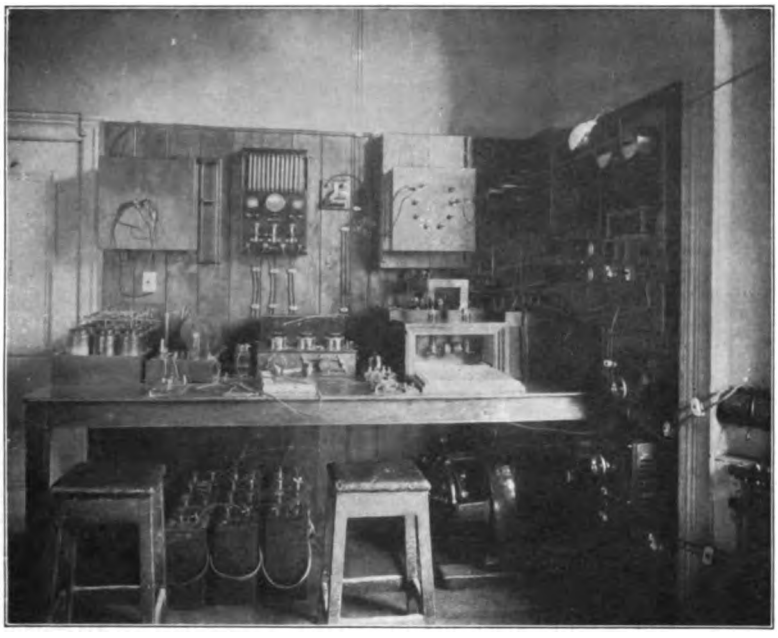
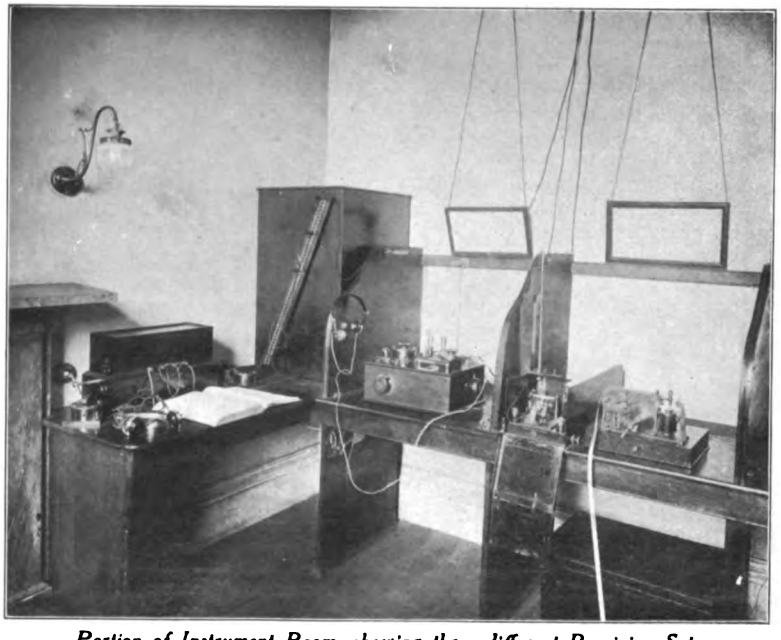


Portion of Instrument Room, showing Complete 1½-K.W. Set and 10-in. Coil Transmitting Set.

ments on board large steam yachts, foreign warships, and even airships ; also special work on land in foreign countries. From time to time articles appear in this magazine describing the varied experiences of wireless operators.

On many ships the operator receives nightly from the high-power stations on shore the condensed news of the world for publication on board his ship. From other ships he obtains first-hand messages containing information as to the meteorological conditions, ice reports, presence of fog and derelicts in certain latitudes and longitudes.

The importance of an operator attending strictly to business can be realised by the following instance : A few months ago the writer was in conversation with one of the engineers of a cargo ship (which was totally burnt at sea during 1910), who, with half the crew, spent four or five days in an open boat, the remainder of the crew taking to another boat, which was sighted and picked up by a Leyland liner. The rescued men informed the captain of this Leyland liner that the other boat was lost sight of during the first night after leaving the wreck, and was, probably, still missing. The captain, by means of the Marconi system, notified all other ships with which his ship communicated that another boat containing members of the crew of the burnt cargo ship was at sea. These ships kept a special look-out for the boat, and a Cunard liner was successful in sighting the missing boat and rescuing the men, who, by long exposure, were in a bad state. This engineer stated very



Portion of Instrument Room, showing three different Receiving Sets.

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definitely that had it not been for the Marconi system they would not have been rescued alive.

Another instance of the utility of wireless telegraphy may be cited. An outbreak of plague occurred at one of the Mediterranean ports to which a liner was bound, and by means of wireless the ship's destination was altered to another port free from the infectious disease, thus saving the unnecessary steaming of a great number of miles on the part of the ship, and also preventing a great deal of unnecessary delay and inconvenience to the passengers on board.

These instances of the utility of wireless telegraphy could be multiplied *ad infinitum*, but I think that enough has been said to show how full and interesting is the life of an operator in service, the duties calling for the exercise of the highest faculties and mental alertness, such as render the work of first-rate importance. To the man who enters the service without an exaggerated notion of his own individual importance, or whose head is not likely to become swollen by the responsible nature of his work and the donning of uniform, there are many opportunities for advancement, provided he is capable and assiduous in the discharge of his duties, and means to devote himself whole-heartedly to the work, and to "bide his time." Let him not for one moment suppose that in the operating side of wireless telegraphy he has discovered a short and easy way to an "El Dorado"; but without painting an alluring picture, let me unhesitatingly say (as one who has gone through the mill) that the attractions and the remuneration are such as make a favourable bid for the entry of capable and zealous young men. There is plenty of room in the service for the right sort of worker, but for the shirker, none—absolutely none.

The accompanying illustrations refer to the Liverpool School, which was recently removed to its present address, Crosby Road, Seaforth. It was established in 1903 at Seaforth Sands, near Liverpool, and was the first wireless school in existence. Mr. F. Jones, who is in charge of the school, was for many months chief wireless operator on the "Lusitania," and he has also served on other vessels.

To encourage officers in the Army stationed in the French overseas possessions to study wireless telegraphy and to understand its operation, the Colonial and War Offices have arranged to make certain concessions in the matter of pay and leave of absence to Colonial officers who make themselves proficient in the subject.

The Development of the Congo

ON February 4th, 1911, a wireless telegraphy expedition left Antwerp, Belgium, on the "Elisabethville" for the Congo. This expedition was organised by M. Goldsmith, of Brussels, for the King of Belgium.

The purpose of the expedition is to erect several experimental wireless stations and test the practicability of establishing wireless communication with Europe, and extending the system throughout the territory of the Congo. It is believed that wireless will be better suited to the conditions of this vast country than the wire system, on account of the great stretches of jungle and marsh, where wiring is extremely difficult, and on account of the ravages of storms and wild beasts, especially of elephants, who seem to delight in pushing over the poles. At present it takes anywhere from 3 to 15 days for a message to go one way between Boma and Washington. This is on account of the circuitous and irregular journey the message must travel. A message started at Boma is transmitted by wire to Leopoldville, 165 miles farther up the Congo River; from there it goes as best it can by wire when the connections are not destroyed by storms or elephants, and by foot messengers when they are, to Libreville, on the coast of the French Congo, and is then passed on via St. Vincent and the Azores to America. When communication is established between Boma and St. Paul de Loanda the time will be cut down to about two or three days.

It is interesting to note that the "Elisabethville" carried the first steamship wireless installation to the Congo. The system used on that vessel is the Marconi, and for the first two trips was in charge of an expert operator sent especially to study the conditions in the Tropics. He reports that atmospheric electricity by night and the effect of the sun's rays at certain times by day make long-distance communication impossible in the Tropics, but that there are times, notably at about 5 or 6 a.m., when these disturbances are at a minimum, and long-distance messages can be received. A few years ago it was considered impossible to use wireless in the Tropics, but now, with perfected Marconi instruments, we may soon hear of man's latest means of communication serving in the wildest and least-known parts of the globe.

The Prince of Monaco has started upon his scientific expedition in the newly-built vessel "Hirondelle," which, in addition to possessing a complete equipment for studying problems of the ocean, is furnished with wireless apparatus.

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Does Wireless Affect the Climate?

THE torrid heat of the past summer has led to a renewal of the oft-discussed question whether the world's climate is changing. People's range of vision in matters meteorological is extremely limited. A person's ideas of the characteristics of the weather experienced during the first fifteen or twenty years of his life are very vague, and the tendency, therefore, is to compare the event of the moment with what can be remembered about a few recent years, and so it comes about that a hot summer is the hottest ever known, and, clearly, our climate is changing—becoming warmer than it used to be. Similarly, a cold and wet summer is conclusive proof that our climate is becoming cold. The very severe and prolonged frost in the early months of 1895 was accepted by many as settling the question of our winters becoming colder. Yet every winter since that date has been remarkably mild and open. Just a year ago it will be recalled that over Europe generally the summer was of a most inclement character—bitterly cold and scarcely a day without rain. Everybody seemed to demand an explanation of the disagreeable conditions, especially as it was remembered that the previous summer, that of 1909, had also been cold and wet. Now, if one season suffices to determine in the public mind the trend of our climate, surely two successive summers similar in character will set the matter at rest for ever. Last year, then, the question was finally solved to the satisfaction of the multitude.

The Problem Examined.

It was, however, necessary to offer some sensible reason for this remarkable change in our climate, and no less an authority than M. Camille Flammarion, the celebrated French astronomer, as a writer in the *Morning Post* reminds us, was induced to examine the question on novel lines. His investigation led to the startling announcement that the climate of the world was settling down to be cold and wet in consequence of the very disturbed state of the atmosphere resulting from the discovery of wireless telegraphy. Hertzian waves were being dispatched in every direction through the earth's atmosphere all day and all night, so that there was perpetual and violent commotion in the air, resulting in continual cloudiness and precipitation. Such a conclusion, announced over the name of a distinguished *savant*, was immediately accepted as the correct solution of the problem by the general body of newspaper readers here and on the Continent, until, in January last, it was shown in the columns of the *Morning Post* that there was not the slightest reason for associating weather variations of any character with wireless telegraphy. Had M. Flammarion been right in his deductions, then the summer of 1911 ought to have been colder and more rainy than its predecessors, because, in the interval, there has been a vast increase in the number and frequency of Hertzian waves over land and sea.

The intense heat and drought of this year have effectually disposed of wireless telegraphy as the one great factor in producing cold and wet. This leaves the inquisitive public once more without a leg to stand upon when discussing questions relating to the weather and its origin. Comets and sunspots and other celestial phenomena have had their day, and now that the most up-to-date twentieth-century Hertzian waves have been discredited, it is difficult to know in what direction to seek a solution that would satisfy both the public and the more exacting scientific investigators.

Seventeenth-century Chroniclers.

But all the discarded ideas of the past were arrived at through starting from the assumption that our climate is changing without taking the trouble to ascertain what evidence there is to support such a notion. The experience of a single life is not sufficient to determine such a world-wide subject. At the last Dublin meeting of the British Association Sir John Moore read an interesting paper on the change which it is so frequently asserted is taking place in our climate. He had consulted references to the weather extending through several centuries, and found that hundreds of years ago there was precisely the same disorder and uncertainty about our seasons as we experience now. Heat and cold, rain and drought, occurred with the same irregularity as they do in our own day. Mr. Walter Sedgwick has contributed a series of articles to *Symons's Meteorological Magazine* on "Weather in the Seventeenth Century," and in the July issue he deals with the character of the summer season as evidenced in the diaries of John Evelyn and Samuel Pepys. The extracts given cover the period from 1636 to 1705, and if the dates were omitted a twentieth-century reader would say that the descriptions certainly refer to our varied experiences in quite recent times, so well do they tally with what we can remember about warm and cold, wet and dry summers.

M. Branly, who introduced a coherer which is used in wireless telegraphy, has been presented with the sum of 40,000 francs, which had been subscribed in France to enable him to continue his researches.

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THE MARCONIGRAPH

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The Editor will be pleased to receive contributions; and Illustrated Articles will be particularly welcomed. All such as are accepted will be paid for.

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The Share Market.

Marconi shares have been active during the past month, notwithstanding the unrest caused on the London Stock Exchange by the war scare in Europe. The closing prices on September 27th (the date we went to press) were as under:

Ordinary	44s. 6d.	45s. 6d.
Preference	36s. 3d.	38s. 9d.

Mr. Marconi in Canada.

Mr. G. Marconi has just returned from Canada, the main object of his visit being to inspect the transatlantic station at Glace Bay and to determine whether Newfoundland would afford a suitable place for the establishment of an auxiliary station in connection with the transatlantic service. Experiments were carried out in Newfoundland, and it is worth placing on record that during the time he was in Newfoundland the first messages were received at St. John's, direct from Clifden, in the presence of Sir Edward Morris, the Prime Minister of the colony, and several officers of H.M.S. "Brilliant."

The Wireless Link.

The Imperial Government are understood to have under consideration a huge scheme intended to unite the various parts of the Empire in a wireless telegraphic system having direct communications with the Admiralty in London. Not only are efforts being made to improve wireless facilities in Canada, in the Mediterranean ports, India and Australia, but steps are also being taken to link more effectively all other parts of the Empire with one another. This action upon the part of the Government is a practical sequel to the Imperial Conference of last May, when the efforts of the Colonial Premiers were strongly directed towards improving communications between the Oversea Dominions and the Homeland. It was accordingly decided that a first chain of Imperial high-power wireless stations should be erected—one station in England, one at Gibraltar or Malta, and one each at Cyprus, Aden, Bombay, Singapore and Australia. England and Canada are, of course, already in communication through the existing stations, and a continuous commercial service is being conducted between the two countries day and night. It is confidently expected that in a short time the Government's wireless programme will have so far advanced that the Admiralty authorities will be able at any moment to direct the movements of practically every unit of the British Fleet. Apart from its directly practical effect in war time, which will no doubt be partially tested by a peace alarm or two, this Empire wireless system will have much value in helping to make the new scheme of allied British Navies a reality to all the partners. By the scheme the school of concentrated control and the Dominion schools of naval autonomy have been reconciled, and this wireless link will assist both to realise the meaning of the new position.

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The Electrical Exhibition at Olympia

A New Wireless Set for Cargo Vessels

OWING to the fact that we are obliged to close these pages for press some days before the end of the month, we are unable to present an account of the Electrical Exhibition which was opened at Olympia, London, on September 23rd, and which will remain open until October 21st. One feature, however, should be mentioned, not only because it will be readily observed by the thousands who will flock daily to Olympia, but because it is sure to be a particular attraction to the many engineers—particularly marine engineers—and business men who will visit this interesting exhibition. We refer to the stand of Marconi's Wireless Telegraph Co., Ltd.

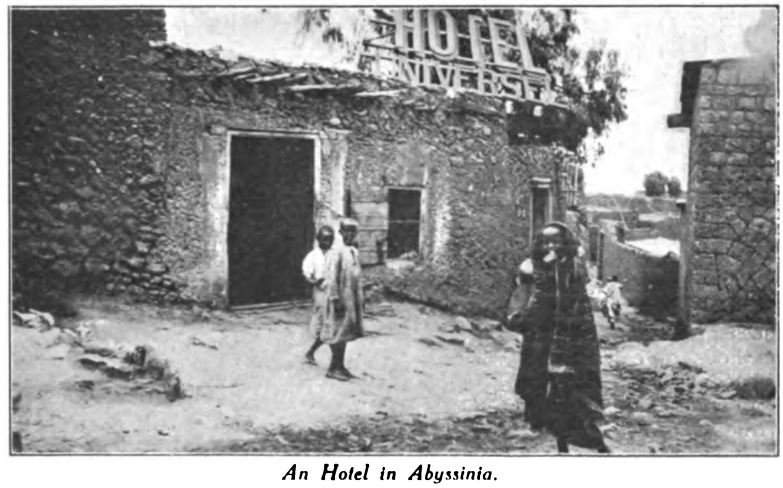
This stand will contain a new and extremely interesting and important model of wireless telegraph installation for use on ships. The Marconi Co.'s 1·5-k.w. ship station still remains the standard type for use on ships of the class for which it was originally designed—namely, passenger liners of medium size. Some of the larger boats built within the last few years have been fitted with 3-k.w. or 5-k.w. stations, and the company have now turned their attention to the production of a ½-k.w. station suitable for use on the smaller passenger steamers, cargo boats and destroyers. The following are the principal features of interest in the station. The convertor, which is used for supplying alternating current of a suitable frequency, has a vertical shaft which carries on its upper end the insulated, metallic-toothed disc which is used in the Marconi rotary discharger. This disc is enclosed in a silencing casing in which are mounted the discharge electrodes, and which is ventilated by a small fan. The transformer is air-cooled, and consists of a primary and secondary bobbin constructed on the lines of an induction coil, but mounted on a vertical core, the iron circuit of which is closed by a double yoke, the whole being enclosed in a perforated metal casing. The high-tension leads are taken up to a pair of protecting coils mounted on the top of the transformer. The condenser consists of a battery of glass tubes which are copper-plated inside and outside; they are carried in a metal stand fitted with a protecting spark-gap.

The oscillation transformer consists of a fixed primary and a secondary, the turns of which can be varied to suit the wave-length required, and the position of which can be varied relatively to the primary in order to vary the coupling. A primary inductance of bare copper strip is provided for adjusting the wave-length of the primary circuit.

A noticeable feature in the ½-k.w. station, as compared with the 1·5-k.w., is the absence of oil tanks for transformer and condenser, and the small amount of woodwork used.

An Abyssinian Hotel

THE wireless operator with a taste for adventure has occasionally the opportunity for enlarging his store of worldly knowledge and experience, and many are the tales told of exciting deeds performed, or of strange sights seen. On looking at the accompanying illustration, who can doubt but that the nomadic operator who had the hardihood to penetrate into so primitive a place as that depicted will have tales to tell which would be listened to with eagerness by those who have never ventured so far? The photograph was taken in the ancient city of Harrar, Abyssinia by Mr. S. T. Dockray, the officer in charge of the wireless station at Berbera, Somaliland, who has been doing a "trek" through Abyssinia with the Commissioner of Somaliland.



An Hotel in Abyssinia.

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Reviews of Books

"PRINCIPLES OF WIRELESS TELEGRAPHY," by George W. Pierce, A.M., Ph.D. (The McGraw-Hill Book Co., 12s. 6d. net.)

Some years ago the literature of wireless telegraphy was very sparse, but more recently one book after another purporting to expound the subject has appeared, until there would seem to be no room for more. When these books are examined, however, it is seen that, while one or two of them have become standard works upon the subject, the vast majority appear to have been written with the object of extolling the merits of some particular "system," and, though full of beautiful pictures of highly-polished wood and lacquered brass, contain practically no information of value to the student of wireless telegraphy.

The book under review belongs to a very different category. It purports to explain the subject to the student without the use of higher mathematics, and we know of no book which achieves its object so well. Too often when one sees in a preface that mathematics have been avoided "as far as possible," one finds that the omission is due to the inability of the author to employ them. That evidently is not the case here, for, although they are avoided, the explanations given show the deepest knowledge of the phenomena discussed, and the student is clearly shown that such knowledge can only be obtained through them—though much may be obtained without—by the aid of this book.

The opening chapters are devoted to an explanation of the phenomena concerned. Then follow excellent chapters on the work of Maxwell and Hertz; the electromagnetic theory of light and the phenomenon of stationary waves being particularly well explained in very few words. After that come chapters on the development of wireless telegraphy, throughout which we recognise the unbiassed opinion of a competent judge. Whenever the question of priority arises the author goes to the original documents for his information, and we are content to accept his conclusions without criticism. Next come chapters on detectors, resonance and tuning, the arc and the quenched spark, directed wireless telegraphy, and wireless telephony. The book ends with appendices giving the definitions of units, and the methods of calculating resistance, inductance and capacity, which are of value for reference.

We cannot pass over this book, however, without drawing attention to one or two defects. On pages 14 and 15 are illustrations of the magnetic field as shown by iron filings, in which the filings have not only oriented themselves all over the sheet, but have actually collected themselves together in more or less equally spaced lines. On page 38 we find the statement: "The displacement-current differs from the ordinary current in that there is within the molecules nothing corresponding to ordinary resistance, so that none of the energy of the displacement-current is converted into heat." This is not only incorrect, but appears to us to be the very place to introduce the conception of dielectric hysteresis, which, by the way, seems to have been entirely omitted except for the footnote on page 25. The latter part of chapter XIV. is devoted to the subject of the grounding of circuits, but we are not entirely satisfied with the author's conclusion that an earth is not necessary. Is the effect upon the receiving station the same if the earth is replaced by a counterpoise? We know it is if the counterpoise has sufficient area, but in this case is it not a very efficient capacity connection to earth?

Finally, we would advise all students of wireless telegraphy to read this book, while those to whom mathematical treatises are closed books cannot do better than take this as their standard.

"MAXWELL'S THEORY OF WIRELESS TELEGRAPHY," by H. Poincaré, translated by Frederick K. Vreeland. (Constable & Co., Ltd., 10s. 6d. net.)

The object of this book, as explained in the preface, is to give a physical treatment of Maxwell's theory and its applications to some modern electrical problems, to set forth the fundamental principles which underlie all electrical phenomena, according to Maxwell and his followers, to show how these principles explain the ordinary facts of electricity and optics, and to derive from them a practical understanding of the essentials of wireless telegraphy. This is what M. Poincaré has done in the first part of the book. In the second part Mr. Vreeland takes up the thread where M. Poincaré left off. The book is not intended as a treatise on wireless telegraphy; no attempt is made to describe the forms of apparatus. The object is rather to deal with principles and to trace the development of the art in its essential features. Where specific cases are cited they are chosen with reference to their fitness to illustrate an idea or to serve as milestones on the path of progress, and they are treated with a view of emphasising that which is essential and minimising superficial or unimportant details.

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Wireless in Peace and War

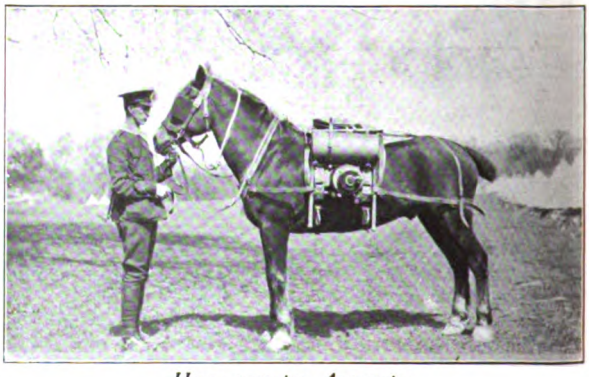
MICHAEL FARADAY will be held in greatest esteem for his electrical discoveries; yet Faraday classed "electric light" with table-rapping and other similar absurdities. What would he have said of electric trains and tramways? He died on August 28th, 1867, and in less than thirty years after electric light was everywhere. How this great man would have stood amazed to hear of electric stations with turbine engines of 15,000 horse-power. How all, or nearly all, of his far-seeing contemporaries would have condemned absolutely the thought that by electric ethereal waves we should be able to communicate with people 2,000 miles away, and without the medium even of wires. The wonder of this latter achievement has almost worn away, inasmuch as it is now a matter of everyday occurrence. Yet it afforded great interest to the visitors who attended Portsmouth recently for the annual meetings of the British Association for the Advancement of Science, and before whom Professor G. W. O. Howe read an admirable paper summarising recent developments in wireless telegraphy, and Captain H. Riall Sankey illustrated the portable wireless plant introduced by the Marconi Company.

A Pack Horse, showing Masts.

A Dying World.

The President, Sir William Ramsay, in a brilliant address deploring the depletion of the coal supplies of the country, painted a picture of a dying world slowly growing colder, with its inhabitants crouching in dim caves hollowed out in order to be nearer the central fires of the earth, such as one with which the gloomy fancy of Mr. H. G. Wells has familiarised us. But science and the art of engineering have made such wonderful strides that there is no reason to fear but that a substitute for coal will be found. This subject has received so much attention in the daily and weekly newspapers that we may leave it for a review of the proceedings relating to wireless telegraphy,

Professor Howe stated that the total number of ships of the mercantile marine fitted with Marconi apparatus at the end of 1907—that is, after seven years of development—was 140; at the end of 1908 the number was 220; at the end of 1909 it was 330; while at the close of last year it had risen to 510. In addition to the mercantile marine, practically every ship in the British Navy has been fitted with the Marconi apparatus. Marconi's earliest experiments were made in 1895–6; and now, after fifteen years, every passenger ship of any magnitude has its wireless installation as a matter of course. There is every indication that very soon practically every ship will be so equipped. As was recently pointed out by Mr. Bradfield, of the Marconi Company, the increase in the number of installations will probably be cumulative, since each installa-



Horse carrying Apparatus.

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tion on sea or land increases the value of the service to every ship making use of it.

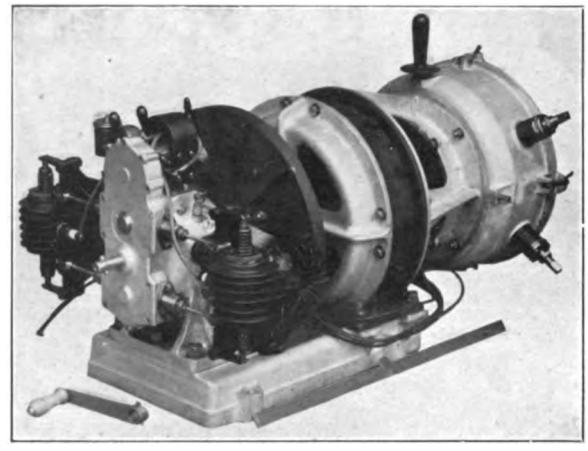
Reliability of the Marconi System.

There was, however, one aspect to which Professor Howe drew attention, and that was that the troubles due to interference between stations working simultaneously would also increase cumulatively. The nature of the telegraphic service which might be required of a station was very varied. A station might have to work with only one other station and never send to or receive from any other. This was practically the case with the trans-atlantic stations. A station might work with a limited number of stations of definite and well-known characteristics, as in the case of the mail boats running between England and the Continent. On the other hand, a station might have to correspond with all comers.

One can see that apparatus which might be eminently suitable in one case would be very unsuitable in the other. Stations in the first category can use uncommon wave-lengths, and thus free themselves, to a large extent, from interference from other stations, besides being able to use a large amount of power without causing interference. The Marconi transatlantic stations in Ireland and Nova Scotia use a wave-length of over 6,000 m. (50,000 periods per second), and are thus free from disturbance from ships, which generally use 300 m. or 600 m. Stations of the third class, on the other hand, should be able to call or be

Another View of Cavalry Set.

called by ships or land stations fitted with any make of apparatus covering a wide range of frequency. To appreciate the difficulties due to interference, one has only to consider the case of a station on the Kentish coast, with half-a-dozen ships within range, all wishing to communicate with the land station. They can only communicate one at a time, and each operator naturally tries " to catch the Speaker's eye," which, in this case, is the coast operator's ear, by calling often and loudly, any regulations to the contrary notwithstanding. The same



Engine and Dynamo for Cavalry Set.

thing may be going on at other coast stations on both sides of the Channel.

Atmospheric Disturbances.

If it were possible for every station and every ship to have a different wave-length, interfering stations might be tuned out to a certain extent, but for the sake of uniformity and convenience in working, the majority of stations have about the same wave-length, so that when one is tuned to receive the desired message, one is also tuned to the disturbing stations. The result is that one station tries to shout the other down, and the successful working of all the stations is greatly hindered. Apart from all this, there are the atmospheric disturbances, which vary very much from time to time. When a station is receiving from another station at a distance of 1,000 miles, it will certainly " pick up " every lightning flash over a large part of the earth's surface. These atmospheric disturbances are often strong enough to make working impossible over any but very short distances, even when the weather conditions locally look ideal. Whether one can receive or not in spite of the atmospheric disturbances depends on the nature and loudness of the signals, so that one can become more and more independent of the atmospheric conditions by increasing the power employed, and by making the signals easily distinguish-

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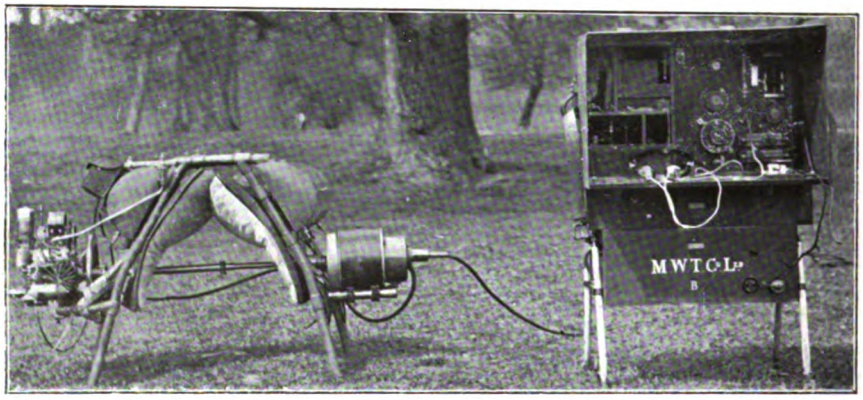
able from the sounds caused by the disturbances.

Recent developments in the sending apparatus have been largely directed towards obtaining freedom from interference. This has been sought in two ways—firstly, by sending out well-sustained trains of waves of one definite frequency, thus permitting sharper tuning; secondly, by giving the signals a high musical pitch, easily distinguished from the crackling noises caused by atmospheric disturbances, and also from other stations having notes of a different pitch. The spark-gap must be so designed that these characteristics are retained when very large powers are employed. A gap may give excellent results when the power is small, but fail entirely when the power is increased. Absolute reliability and constancy are of far greater importance than efficiency, although any improvement in the latter is naturally to be welcomed, not so much for the saving of power as for the reduction in size and cost of the apparatus. The magnetic detector used by the Marconi Company, said Professor Howe, was ideal in its simplicity and reliability.



Marconi Set in the Field.

A Musical Note.

To produce a musical note of high pitch it is necessary to make the sparks follow one another rapidly and with great regularity. When sending at a speed of twenty words per minute, the duration of a dot will be about $\frac{1}{20}$th of a second, so that with a spark frequency of thirty per second the dot will consist of one or, at the most, two sparks, whereas with a spark frequency of 1,000 per second the dot will consist of fifty sparks. The former was quite enough to actuate a filings coherer, but would merely cause a blow on the telephone diaphragm, whereas the latter would give a short piping note in the receiver. By increasing the alternating supply voltage or by shortening the spark-gap, a large number of sparks can be made to occur during each half-cycle, but they will occur too irregularly to produce a musical note, unless steps are taken to make the sparks occur at regular intervals. This can be done by replacing the stationary gap by two discs revolving at high speed, the rims of the discs being provided with projecting knobs, between which the sparks jump. The simplest way of obtaining 1,000 sparks per second with great regularity is to use an alternator giving 500 cycles per second and adjusting the voltage until the gap breaks down once every half-cycle. To ensure regularity the gap must be kept cool, and the after-effects of each spark quickly removed. With the ordinary stationary gap this can be done by means of an air-blast, but with the Marconi revolving discs the air-blast will hardly be necessary.

Captain Sankey on the War-path.

At the end of Professor Howe's paper, Captain Sankey exhibited a number of slides illustrating the portable wireless plant introduced by the Marconi Company. Of these equipments, one was arranged for cavalry use, the limit of weight per horse being fixed at 185 lb., and the actual weight a little less. The whole outfit was carried by four horses, and there were four more carrying riders in attendance. No. 1 horse, he stated, carried the aerial and various odds and ends arranged in two boxes, which simply hooked on to the special saddle used. No. 2 horse carried the high-tension equipment on one side and the low-frequency plant on the other. The high-tension portion was sealed into an hermetically closed box, and was therefore weatherproof.

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The low-frequency instrument box opened out, leaving all necessary parts accessible to the operator. Both valve and crystal receivers were used. The third horse carried the petrol-engine and the dynamo used for generating the primary current, and also the requisite supplies of petrol. The saddle itself could be lifted off by four men and rested on the ground, and then formed the framework supporting the engine and the dynamo. These were connected by a flexible shaft, which was removed when the saddle was replaced on horseback. The fourth horse carried the two masts, each of which consisted of ten lengths, each 6 ft. long. These were hollow hexagons in section, so as to be light, strong, and capable of being closely packed. The earth used was a mat of copper gauze. The aerial was stretched between the two masts as a horizontal conductor, 350 ft. long. The sending apparatus was connected at one end of this, and a directed wave was obtained, the strength of wave being much greater in one direction than elsewhere. This plan had, he said, great advantages for military equipments. The saddle framings were all constructed out of bicycle tubing, padded to fit the horse, and each saddle would stand when rested on the ground. With skilled men the time needed to erect the plant ready for working was 9 minutes, and to dismantle and pack it again 6 minutes. With unskilled hands in Turkey the equipment, at the first time of asking, had been erected in 21 minutes. One infantry set was identically the same equipment, but carried in two carts. The power needed was 400 watts, and the range, even in mountainous regions, was 20 miles. Over moderately hilly country it was 75 km., and over sea 100 miles. A more powerful equipment with a generator yielding 1½-kw. was also supplied, and this had a range of 200 miles. In this case the height of the masts was 80 ft. instead of 60 ft. The generator supplied 300 sparks per second. This equipment was all carried on a single motor-car.

Professor Dalby, who occupied the chair in the absence of Professor Biles, moved a vote of thanks to the authors, and the discussion was opened by Mr. E. Kilburn Scott, who asked whether any trouble was experienced with nitro-peroxide gas generated by the spark. This, Captain Sankey replied, was not the case. Another speaker asked whether it was necessary for the attendant at the receiving end to be always listening, or whether there were means of attracting his attention.

Captain Sankey then said that the operator at the receiving end had to wear the telephonist's apparatus, but this was no great drawback, as he could be reading a novel until called. Discussing Professor Howe's paper, he said that there would soon be a long-distance transmission at work from Coltano, Italy, and in South America. He also remarked that it was interesting to observe that if a spark lasted one-twentieth of a second, the wave would in that time have traversed 9,500 miles.

Professor Dalby asked for information as to the longest and the shortest wave-lengths practically employed, and whether it was possible, if desirous of receiving a note of 2,000-ft. wave-length, to tune out one of 2,100 ft.

In reply, Professor Howe said that on the transatlantic service a wave-length of 20,000 ft. was employed, and in the other direction about 300 metres was the minimum length used. Most ships were equipped with apparatus designed for wave-lengths of from 300 to 600 metres. As to how far waves could be tuned out at the receiver depended upon the plant at the transmitting station. If the latter gave a well-sustained wave, it was easy to tune it out; but it was impossible to tune out an explosion, which was what was transmitted by some stations. The stations on the French coast in particular were fitted with very bad apparatus, so that, in fact, it was impossible to say what their frequency was supposed to be. The Clifden transmission, on the other hand, was easily tuned out.

Personal

Prince Alexander of Teck will preside at the opening of the winter session of the Middlesex Hospital Medical School on October 2nd. Dr. Comyns Berkeley will deliver the introductory address to the students, and the prizes gained during the previous year will be distributed by Mr. G. Marconi. The banquet to past and present students will be held the same evening at the Trocadero Restaurant, when Prince Alexander of Teck will be present, and Mr. Marconi will be amongst the distinguished guests.

Mr. Marconi has fixed Monday, November 27th, when he will preside at the dinner to be held at De Keyser's Royal Hotel, London, E.C., in aid of the funds of the Newsvendors' Benevolent and Provident Institution.

At the Mansion House, recently, Mr. J. Henniker Heaton was presented by a gathering of Australian bankers with an illuminated address in recognition of the fact that he had been largely instrumental in bringing about penny postage with Australia.

Mr. E. J. Wagstaff, who has been engaged in the traffic department of the Marconi International Marine Communication Co., London, during the past six years, was married last month at St. Stephen's Church, Camberwell, to Miss M. E. Phillips. The directors and staff, to mark the event, presented Mr. Wagstaff with a splendid canteen of cutlery.

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Light Waves

A DECADE has almost passed since Mr. Marconi, travelling across the Atlantic in the steamship "Philadelphia" in the month of February, 1902, received a "wireless message" printed in ordinary Morse type from his station at Poldhu, near the Lizard. To-day such messages pass hourly, not only between ships at sea and from ships at sea to stations on land, but between Clifden in Ireland and Glace Bay in Nova Scotia. When contemplating the marvels of wireless telegraphy from the physical point of view and in the simplest way, the startling suggestion presents itself that there is no essential difference between the flickers of light used as signals by a savage tribesman when he waves a beacon, to warn his friends a few miles away of the approach of danger, and the invisible signals that sweep across the ocean from one Marconi station to another. The savage with his torch and the highly-trained electrician at Clifden each in his own way generates waves in that "ether" which, as we believe, permeates every speck of matter and fills every nook and cranny of the universe. The success of the signal in the one case as in the other depends upon these waves falling upon a suitable receiver—the human eye or some substitute for the eye—at the end of their journey through space. And yet there is this difference between the light waves produced by the savage and the electric waves generated at the stations which stand on the coasts of the world and occupy positions on ships. The latter, to put it very broadly, for there is an immense gap, may be said to begin where the former cease. For, while light waves are so small that many thousands of them can be packed within a compass of a single inch, electric waves are so big that they may be feet, miles, or even thousands of miles in length. In all essential qualities, however, except in size, light waves and electrical waves, so far as we know at present, are identical. The human eye is responsive to the small waves, but not to the big waves. That is why big waves were not recognised until a special instrument had been constructed for the purpose.

Features of Light.

It is interesting and instructive to those who wish to know something about electric waves, which play so large a part in wireless telegraphy, to recall some of the features of light. Light, as we know, travels through space in straight lines with a velocity in air of about 186,000 miles per second. When a ray of light passing through the air or any other gas impinges on a solid object, such as a sheet of polished silver or glass, it may rebound, or be "reflected"; or it may pass through the solid partly or wholly, according to circumstances, this being what occurs when the solid is transparent like glass or a diamond. In the latter case, as the ray enters the solid it is diverted from its original course at the surface of the solid, and again diverted, but in the opposite sense, when it subsequently emerges from the denser and re-enters the rarer medium, the air. We all know also that ordinary white light is not homogeneous, but can be resolved into several components by means of a triangular glass prism, as Newton taught us in the seventeenth century. It is important to remember, further, that since Newton's time it has been discovered that all light is not visible to the human eye. This invisible light has been detected at both ends of the spectrum, some beyond the visible rays at the violet end of the spectrum, and some beyond the visible part of the red end. Thus to the physicist of the twentieth century the term "light" does not apply only to the light we see, but includes other rays which, though invisible to us, can be reflected, refracted, or polarised like ordinary light. Radiations like corpuscules of radium, which cannot be reflected, refracted, or polarised, do not, in this sense, constitute light, though they may generate light when they enter the human eye.

In Newton's Day.

If we could transport ourselves to the days of Newton, and listen to the discussions of the philosophers of the seventeenth and eighteenth centuries, we should find one of the burning questions to be this: Can matter act where it is not? Is action at a distance through a perfect void possible or impossible? To Newton the idea that gravity might be innate, inherent, and essential to matter, so that one body might attract another at a distance through a vacuum without the mediation of anything else, was an absurdity into which no man having a competent faculty of thinking could possibly fall. To the thinkers of the latter part of the eighteenth century the notion that gravity or electric or magnetic attraction might be propagated by a medium seemed wild and ridiculous. To-day the wheel has turned, and again we seek the aid of an "ether" to account for the propagation of light, and to provide a medium through which and by which forces of attrac-

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tion or repulsion seemingly acting at a distance are transmitted across space.

If we abandon the emission theory of Newton, which teaches us that every self-luminous body emits minute material particles which cause the sensation of light when they fall upon the retina, and adopt in its place the modern view that light and radiant heat consist of waves, it seems to follow that these waves must be waves of something or waves in something. This sometimes we call the "ether," and what we know about radiant light and heat assures us that this ether must not only fill all space and permeate every speck of matter, but must be very different from anything we are acquainted with at present. It cannot be solid like a stone, nor liquid like water, nor can it be a gas, for the most perfectly exhausted vessel can transmit light, and therefore must be full of ether; and while the ether must be far less dense than any known gas, and allow things to move freely through it, yet it must possess some quality closely akin to the rigidity of steel. What it is we do not know. We assume its existence and deduce its properties from what we know about a radiant light and heat, and about the waves generated by the oscillating electric charges of the Leyden jar and similar electrical contrivances for producing flashes of artificial lightning. Without an ether, a wave theory of light would seem an absurdity. For if light consists of waves, and if the interstellar space be a mere void, what becomes of a ray of light emitted by the sun on its journey to the earth during the period of about eight minutes when it is neither on the sun nor on the earth? Is it not evident that the wave theory of light imperatively asserts the existence of an ether, and reopens the great question settled in one way by Newton, and in the opposite way by his successors in the eighteenth century? Up to to-day nothing has been done to settle this vexed question as applied to gravity.

Electromagnetic Theory.

The wave theory of Young and Fresnel was scarcely established before Faraday observed that a strong magnet exercises a peculiar action on polarised light, and proposed, in 1846, as a subject of speculation, an "electromagnetic theory of light." This theory was developed twenty years later by Clerk Maxwell, who found the "elasticity" of the magnetic medium in air to be so nearly identical with that of the luminous ether as to leave little room for doubt that "these two co-existent, co-extensive, and equally elastic media are really one medium—viz., the ether of the undulatory theory of light"; and before many years had elapsed it was held generally by the younger English physicists that electrical disturbances are transmitted by means of the ether, and that electric vibrations do not differ essentially from light waves. In 1883, at a meeting of the British Association, the late Professor G. F. Fitzgerald carried the matter a step further by proposing a method of producing electromagnetic disturbances of comparatively short wave-length by utilising "the alternating current produced when an accumulator or storage battery is discharged through a small resistance."

Mimic Lightning.

Probably each of us has seen at some time the mimic lightning of a Leyden jar. If so, two things will be remembered. First, that at the moment of discharge there was a blinding flash between the two discharging spheres of the apparatus, and that this was accompanied by a sharp crash or crack. Secondly, that both the flash and the crash were over in a fraction of a second. If the experimenter was asked to explain this mimic lightning, probably he said it was due to the flowing together of two charges of electricity previously communicated to two metallic sheets fixed respectively on the inner and outer surfaces of the jar; and no doubt this explanation was sufficient for its immediate purpose. But it was very far from telling the whole story. For what the observer saw was not, as he may have supposed, the result of a single rush of electricity, but was the outcome of a series of rushes backwards and forwards between the two discharging spheres, which followed one another at a rate that may have been as small as ten thousand, or as great as ten million, or even a hundred million, in a single second of time.

Water Waves.

We all know that waves are generated in still waters when disturbed by the shock of a falling stone; that sound waves can be started in air by the vibrations of a tuning-fork; we believe that luminous waves or light waves are started in the ether by the shock of flint hitting upon hard steel, and, similarly, electricians for some time have believed that the electric discharges which take place during the violent oscillations that constitute the discharges of a Leyden jar generate electromagnetic disturbances or waves and thus radiate energy into the surrounding ether. For a long time, however, it was impossible to prove the existence of these electric waves because they are quite invisible to the human eye. Now, not only is the existence of electric waves proved, but by the brilliant work of Mr. Marconi and his ingenious devices they have become of great commercial, scientific and national value—a factor in the comity of nations and the well-being of mankind.

Owing to the drought the whole of the British cavalry manœuvres were abandoned this year. The wireless telegraphy and aeroplane trials proceeded, however, at Aldershot and Salisbury under local conditions.

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Maritime Wireless Telegraphy

THE P. and O. R.M.S. "Morea," when at Sydney in August last, reported having established wireless communications over record distances during the voyage from Colombo to Sydney. The following are a few extracts from the "Morea's" wireless log-book: Wednesday, July 12th.—5.25 p.m., communicated with R.M.S. "Marmora," bound west, and exchanged positions—"Marmora's" position, lat. 21.50 N., long. 105.30 E.; "Morea's" position, lat. 8.52 N., long. 93.13 E.; distance, 1,035 miles. Sunday, July 16th—3 p.m., communication established with R.M.S. "India," and positions exchanged—"India's" position, near Wilson's Promontory; "Morea's" position, 490 miles north-west of Fremantle; distance, 2,068 miles overland. Monday, July 17th—5.10 p.m., communicated with R.M.S. "Orsova," distance, 890 miles; 5.17 p.m., communicated with s.s. "Medic," distance, 970 miles. Sunday, July 22nd—10.30 a.m., communicated with s.s. "Ascanius," and received one private message from "Ascanius." Positions exchanged—"Ascanius's" position, 300 miles south-east of Albany; "Morea's" position, near Cape Otway; distance, 1,605 miles. All of these communications were effective both ways, as evidenced by the fact of positions and messages being exchanged. The communication between the "Morea" and the "India" on July 16th establishes a new record for the Australian coast, as the communication was almost entirely overland, and a communication established over a distance of 2,000 miles overland is equal to 3,000 miles over water. The "Morea" has been equipped with a Marconi installation now for over two years, and has obtained many record communications during that time. The P. and O. Company have Marconi installations on no less than 26 of their ships at the present time.

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During the recent French Naval Review wireless telegraphy played a prominent part in the control of the movements of various vessels.

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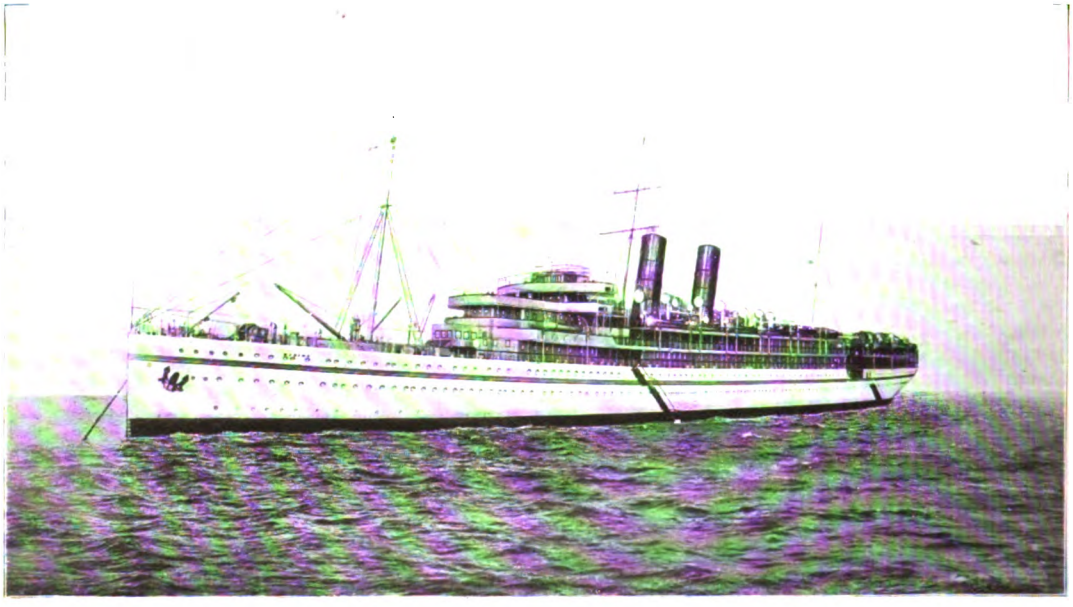
The Marconi International Marine Communition Co., Ltd., have received orders during the past month for fitting the following ships with 1½-kw. and emergency plant: "Somali" (Penin-



The P. & O. liner "Medina," on which King George will sail to India for the Durbar.

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sular & Oriental Co.), "Remuera" (New Zealand Shipping Co.), "Cameronia" (the Anchor Line), "Dongola" (Peninsular & Oriental Co.), "Rawson" (the Argentine Navigation Co.), "Orama" (the Orient Steam Navigation Co.), "Ortona" (the Royal Mail Steam Packet Co.), "Zealandic" (the White Star Line). The following vessels are now being equipped: "Rohilla" (Peninsular & Oriental Co.), "Guildford Castle" (the Union-Castle Line).

The steamer "Karoola," of M'Ilwraith, M'Eacharn & Co.'s line, arrived in Sydney recently, having completed her second voyage with a Marconi installation on board. When off Cape Naturaliste, both east and west bound, the operator established communication with the Marconi station at Cocos Island, and messages were both sent and received. The communication was reported to the captain, who computed the distance from the "Karoola's" position direct to Cocos Island as 2,250 miles. This constitutes a record distance for an inter-State steamer, especially as the communication was effective both ways. During the last voyage the "Karoola" established communication with over 30 different ships, several being over 1,000 miles distant. The operator reports specially that communication was established over long distances with the steamers "Arawa" and "Ruahine," of the New Zealand Shipping Company, which were making their first voyages equipped with Marconi installations.

The *Wireless Herald* is the name of a newspaper published on the Alaskan Steamship Company's steamer "Northwestern." Wireless messages from all over the United States appeared in the first number, and while the liner ploughs her way to Alaska, efforts will be made to keep in touch with all the current news of the day. Besides the news gathered *en route*, the *Wireless Herald* is to keep the location of the vessel on her voyage, speed, etc., answering the first question which arises among the travellers at the breakfast table.

"There is no charge for sending messages to heaven though you have to pay for them on earth," is what the wireless operator on board an Atlantic liner told Mathilde Sinclair, a ten-year old girl, who had that day made her first communion on board the ship. Mathilde was returning with her mother from Paris, and an

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archbishop being on board suggested to Mrs. Sinclair that her daughter should make her first communion before leaving the ship. The lady consented, and the little girl communicated at the hands of the archbishop, who was assisted by four priests, eight sisters of Notre Dame also being present. The captain gave a dinner in honour of the event, with a special cake for Mathilde. During dinner a steward brought her what purported to be a wireless message on which her name was written, and underneath, "To the little angel of the ship." The message was signed, "Your guardian angel." It was with regard to this message that Mathilde questioned the wireless operator. He assured her that he had received the message on his instrument, and supposed that an angel had sent it. Mathilde asked if she could send a reply, and on being told she could, asked how much it would cost. It was then the wireless operator told her there was no charge for sending a message to heaven.

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An Australian mission ship is being equipped with wireless.

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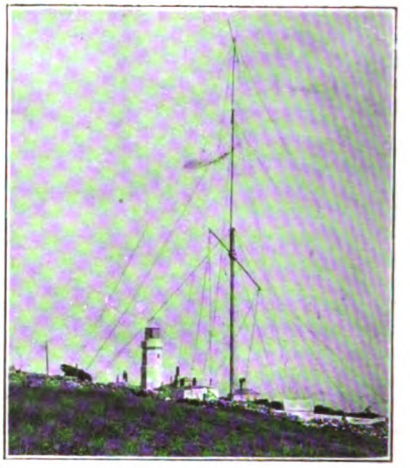
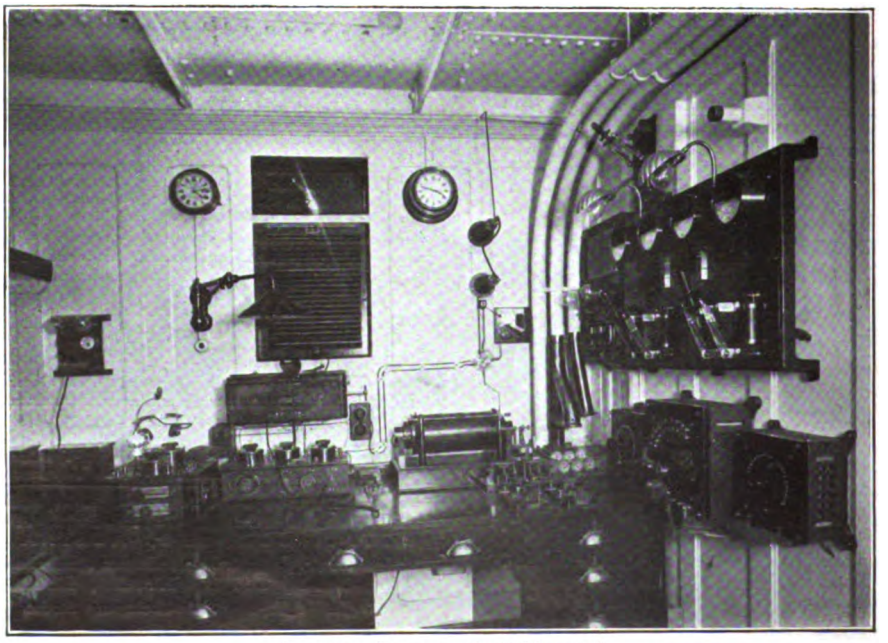
It is of interest to note that from the time when the R.M.S. "Olympic" was run into by H.M.S. "Hawke" at Spithead, until her safe arrival at Southampton, the Marconi wireless installation on board was constantly utilised for sending messages from the vessel to destinations in all parts of the world. Within about an hour nearly 150 messages were dispatched on behalf of passengers on the "Olympic." These messages passed through the wireless station at Niton, Isle of Wight, and were the means of setting up a record for this station



The Niton Station.

in the number of radio-telegrams dealt with by it from any one ship. The illustrations show the Marconi wireless apparatus as fitted on board the "Olympic," and the exterior of the Niton wireless station and the high mast which is the prominent feature of all wireless stations.



Operating Room on the "Olympic."

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Movements of Engineers

Mr. C. James, who left Southampton in July on board the Turkish cruiser "Hamadieh," and who has been assisting Mr. W. B. Cole in the installation of wireless telegraphy on eleven ships of the Turkish Navy, left Constantinople on September 17th for Alexandria, where he will fit H.H. The Khedive's steam yacht "Mahroussa."

Mr. G. Vincent, an engineer lent by the Belgian Co., left for Lisbon on September 4th to fit the Portuguese cruiser "Vasco da Gama."

Mr. C. H. Rattray, having finished the installation of the Greek battleship "Averoff," sailed for Barcelona on September 13th to relieve Mr. H. Dobell, who is returning to England prior to taking up an official Government position abroad.

Mr. H. B. T. Childs is now in charge of the erection of the station at Vigo, where he was assisted by Mr. F. C. Korber until September 24th, when the latter returned to his native country for his term of military service.

Messrs. F. E. Burrowes and K. Tremellan, from Broomfield and Chelmsford respectively, are now attached to the Shipfitting Department.

Mr. A. Flood-Page has returned to London from Poldhu.

Movements of Telegraphists

The following transfers have taken place during the past month :

Mr. J. Mather, from the "Guelph" to the "Macedonia."

Mr. H. Rowlands, from the "Montfort" to the "Sardinian."

Mr. A. Langley, from the "India" to the "Intaba."

Mr. B. Newton, from the "Marmora" to the "Demosthenes."

Mr. W. Matthews, from the "Mount Temple" to the "Montfort."

Mr. A. Bower, from the "Persia" to the "Marmora."

Mr. J. Caldwell, from the "Mantua" to the "Maloja."

Mr. V. Ball, from the "Montreal" to the "Majestic."

Mr. D. Robertson, from the "Empress of Britain" to the "Mount Temple."

Mr. E. Watkinson, from the "Athenic" to the "Ionic."

Mr. A. Entwistle, from the "Otway" to the "Dunvegan Castle."

Mr. W. Gale, from the "Walmer Castle" to the "Somali."

Mr. W. Storm, returned from sick leave to the "Danube."

Mr. C. Gessner, from the "Numidian" to the "Cameronia."

Mr. J. Leverett, from the "Narragansett" to the "Batavier III."

Mr. C. Gordon, from the School to the "Oceanic."

Mr. B. Gillett, from the "Batavier III." to the "Norseman."

Mr. B. Clark, from the "Moldavia" to the "Persia."

Mr. A. Powell, from the "Montrose" to the "Montreal."

Mr. W. Silvester, from the "Merion" to the "Haverford."

Mr. P. Conolly, from the "Campania" to the "Altonia."

Mr. W. Knapman, from the "Megantic" to the "Arabic."

Mr. H. James, from the "Cymric" to the "Carmania."

Mr. H. Bride, from the "Haverford" to the "Lusitania."

Mr. C. Allnutt, from the "Zeeland" to the "Hilary."

Mr. H. Gibsone, from the "Lake Champlain" to the "Empress of Britain."

Mr. J. Connel, from the "Clentent" to the "Celtic."

An Interesting Marconigram

SOME years ago a grave statesman, with the care of a great British colony on his shoulders, sat at a table in a modest cabin on an ocean liner, in mid-Atlantic, a thousand miles on his way from England to America. Before him was a small telegraphic instrument. He had begun life (and was proud of the fact) as a telegraph officer, and the old skill had not deserted him; but never had he expected to send messages from a rapidly moving ship. A few taps; and as he rose his two despatches were being deciphered in London, to be presently delivered. They were addressed to the Chancellor of the Exchequer and the Postmaster-General of the day, urging them forthwith to establish penny postage to the United States; and the sender was Sir Joseph Ward, Premier of New Zealand. Both the occasion and the matter of these communications are noteworthy and interesting. Thanks to the genius of Marconi, who has laboured patiently while we slept, every great ship is in full communication with the shore; the world is one vast whispering gallery.—From an article in the *Nineteenth Century* by Mr. J. Henniker Heaton.

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Diary of Events.

[Under this heading we give a monthly record of the progress of Marconi wireless telegraphy. Apart from the general and historical interest which attaches to such a compilation, we have reason to believe, from the number of inquiries that constantly reach us, that it will be of much service to lecturers, tutors and others who may be professionally interested in the subject. Appended are some notable events that have occurred in October of preceding years.]

1897

October.—Post Office experiments were continued at Dover over several days.

1899

October 30th.—The War Office adopted the Marconi apparatus for use in the field in South Africa, and six of the company's electricians left for South Africa with six sets of Marconi apparatus. The apparatus proved of considerable service to the Army and to the naval squadron in Delagoa Bay, to which several of the sets were subsequently transferred.

October 31st.—Contract signed for the connection of five of the Hawaiian islands by wireless telegraphy—viz., Oahu, Kauai, Molokai, Maui, Hawaii. The stations established in these islands were opened for a public service on March 1st, 1901.

1900

October 1st.—Erection of the high-power station at Poldhu was commenced. The aerials were at first supported by twenty masts, each 210 feet high.

1901

October 1st.—Stations for commercial wireless telegraph communication were opened at Niton, Isle of Wight, and the Lizard, Cornwall.

October 26th.—La Compagnie de Telegraphie sans Fil was formed, with its head office in Brussels, to develop and work the Marconi system on the Continent.

October 12th.—The Cunard liner R.M.S. "Etruria" left Liverpool on her first voyage fitted with Marconi apparatus.

1902

October 20th.—Mr. Marconi left England for Canada on the Italian cruiser "Carlo Alberto." Communication was maintained by him with the Poldhu station throughout the voyage and when the vessel was lying in Sydney Harbour.

1903

October 3rd.—Mr. Marconi sailed on the s.s. "Lucania" from New York, and maintained communication with the shore throughout the entire voyage. News messages from Cape Breton or Poldhu were received and published daily on board. When in mid-ocean this vessel was in communication with both sides of the Atlantic, and private and service messages were received by officers and passengers.

October 20th.—An agreement was entered into with the Newfoundland Government for the supply and installation of Marconi apparatus and stations in Labrador and Newfoundland.

October 24th.—Mr. Marconi left Portsmouth on the battleship "Duncan" to carry out a series of experiments in long-distance wireless telegraphy for the Admiralty. Communication was maintained regularly with Poldhu station throughout the voyage to Gibraltar and also when the vessel was lying in Gibraltar Harbour.

1905

October.—The construction of the new transatlantic station at Clifden commenced.

1906

October 3rd.—The International Conference, called at the instance of the Emperor of Germany, met in Berlin for the purpose of formulating regulations to govern the use of wireless telegraphy. The Conference was attended by representatives of all the great European Powers and many of the principal countries of the world.

1907

October 17th.—Marconi transatlantic stations at Clifden and Glace Bay opened for limited public service.

1908

October 10th.—Agreement made with Brazilian Government for installation of Marconi apparatus on two scout ships and two battleships.

Wireless and Aeroplanes.

THE new airship, the "Adjutant Vincennot," recently acquired for the French Army, is now being much discussed in France, not that it made a great flight, but that it has been the instrument of a new wireless record. Leaving its shed at Compiègne early on one September morning, the airship sailed beyond Mezières and Verdun. It was fitted with wireless telegraphic apparatus, the feature of which was that it weighed only about 230 pounds. During the whole period of the airship's voyage uninterrupted communication with the Eiffel Tower was maintained. Messages were both being received and sent by the airship when it was more than 155 miles from the tower. These are the best results yet obtained. Last year the Clement Bayard airship established a record in wireless telegraphy with 63 miles.

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THE MARCONIGRAPH

No. 8. November, 1911. Subscription, 3/- per annum, post free. Price 2d. Post Free 3d.

Wireless Telegraphy in Russia

DURING last month a very important step has been taken in Russia by Marconi's Wireless Telegraph Co., Ltd. A few years back quite a considerable business was done by the company with the Russian Government, but in recent years they declined to enter into any contracts with any firm unless it was established in Russia, and everything that should be provided to the Russian Government under contract had to be manufactured in Russia.

This course prevented the Marconi Company from tendering to the Russian Government and receiving the substantial share of the contracts for which it had been in the habit of contracting in the past. It opened the door for the formation of a company promoted by some of the most influential persons in Russia, under the style of the Russian Company of Wireless Telegraphy and Telephony. A very fine factory was constructed, and a considerable proportion of the Russian Government contracts fell to the lot of this company.

The system of wireless telegraphy known as the Eisenstein was adopted, and the company is to-day doing a considerable business.

Marconi's Wireless Telegraph Co., Ltd., have now secured the controlling interest in this company, and have granted to it a licence for the Marconi patents. Mr. Guglielmo Marconi, LL.D., D.Sc., and Mr. Godfrey Charles Isaacs join the board of the Russian company, and Mr. Adrian Simpson, a member of the staff of the Marconi Company, is about to proceed to St. Petersburg to act as managing director in Russia.

The Marconi Company have alleged that the Eisenstein system of wireless telegraphy was an infringement of their patents. It was, however, considered to be more satisfactory to come to the arrangement referred to above than to enter into difficult and probably protracted technical patent actions in Russia.

This arrangement disposes of the necessity of the construction of another big wireless factory in Russia, and enables the Marconi Company to take advantage of the very big business both present and future of the Russian Government, besides eliminating much of the competition which it would have had to encounter otherwise.

The Russian Government is expending considerable sums of money in erecting wireless telegraphic stations for the use of both the army and the navy, besides having a very considerable scheme for the erection of post-office wireless telegraph stations throughout Russia. The vast territory which the Russian Empire controls lends exceptional opportunity and advantages for wireless telegraphy.

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Photo] [Elliott & Fry.

GODFREY C. ISAACS

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Godfrey C. Isaacs

Managing Director, Marconi's Wireless Telegraph Co., Ltd.

OUR portrait for this month is a true, faithful, and admirable likeness of Mr. Godfrey C. Isaacs, the Managing Director of Marconi's Wireless Telegraph Co., Ltd.

He was educated in England, in France, and Germany, in addition to which he travelled not a little, the result of his early training and travel being that he is perfect in French and Spanish, and knows thoroughly German and Italian. He began life when very young in his father's business, and his father made him commence at the very bottom of the ladder, and he was kept for some months at directing and stamping envelopes.

He was soon promoted, and, having made the best use of his unique opportunities and exhibited remarkable linguistic power, he passed rapidly through the various departments of his father's vast business, and at eighteen years of age he was the manager of the great concern which he had entered as a lad, and, young as he was, he not only mastered all the difficult questions connected with the foreign trade with which his father was chiefly concerned, but as manager he was able to carry on the important correspondence of the business of the firm in the various languages of the leading customers. But added to this, he at an early age, in the course of his extensive travel in all parts of Europe, exhibited great ability in dealing with leading business men of nearly all nationalities, at an age when most young men have not started on a business career. He showed exceptional powers in weighing the characters of the various business men with whom he had to deal, which helped him very much in the difficulties of the various branches, the chief management of which was left almost entirely in his capable hands.

His cosmopolitan education, his exceptional study of the languages which he speaks, his great courage and resource in dealing with positions of delicacy and difficulty, which continually arise in the conduct of all large businesses carried on in well nigh every country in Europe—the result of all this valuable opportunity used to the full have left him a most able and exceptionally well-equipped man of business.

A charming manner, a most honourable character, invincible industry, a deep sense of duty, and great sense of fairness alike to those with whom he deals in business and those who are under his business control, with a fine bold courage, added to which his firmness, his appreciation of his opponent's point of view in matters of difference, his transparent honesty, and his ever-present interest in the success of his company and the well being of his shareholders, constitute him a model managing director of any large, honourable, and progressive enterprise.

The Marconi Wireless Telegraph Co. at the present time shows, perhaps, the greatest and most important and progressive modern application of science to industry, and probably there is no man in London who is better equipped than Mr. Godfrey C. Isaacs (a brother of the Attorney-General, Sir Rufus Isaacs) to carry on its business in its natural developments throughout the world which seems to be waiting for Marconi everywhere.

With Mr. Marconi, the genius of wireless, at its head, and Mr. Godfrey C. Isaacs in charge of its business, complete confidence existing between them, it seems certain, that with a united Board, as far as anything human can be certain, that with the active support of its shareholders as exhibited at the recent meeting of the shareholders, together with the active work of the loyal and competent staff with which he is surrounded, the Marconi company will increase its most useful, practical, beneficent work, in saving life, in improving and cheapening communication all the world over, and, though last not least, so working as to pay a just recompense to those who support it.

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Experiences of the First Marconi Airship Officer

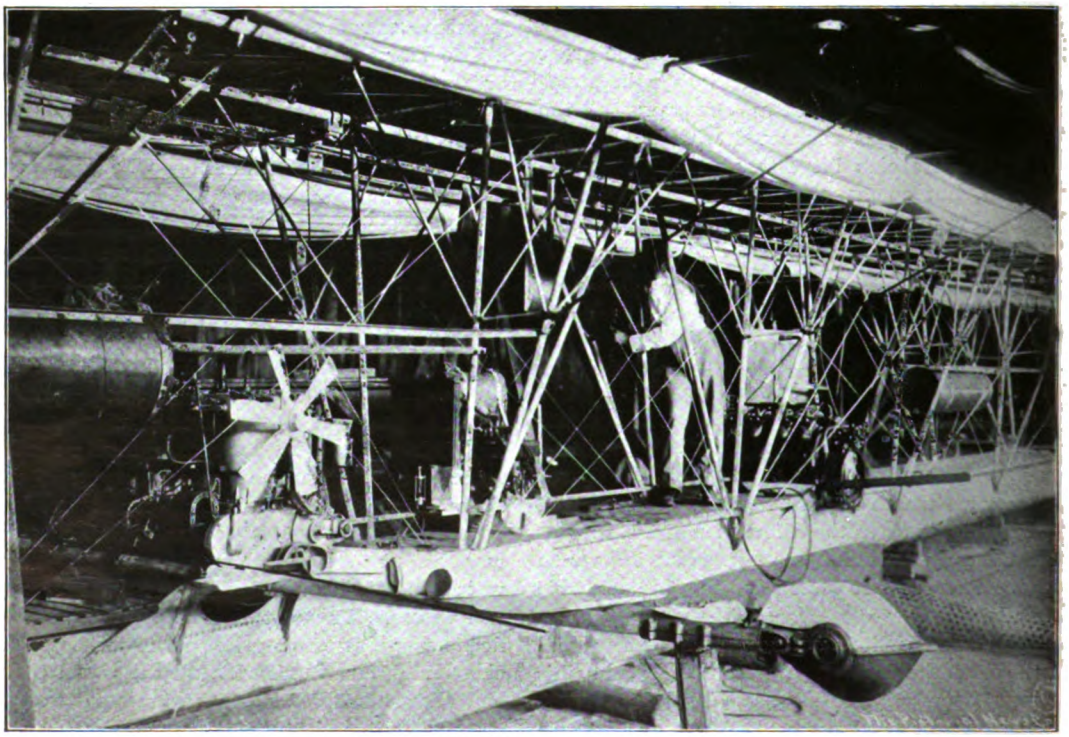
By JACK IRWIN, Operator of the late Airship "America"

IN recording the story of my unusual experience as the first Marconi officer to obtain service on an airship, I am confronted with the difficulty of deciding whether readers of THE MARCONIGRAPH would prefer to have it from the standpoint of the wireless operator, or from that of the passenger. It was my privilege to accompany Mr. Wellman in that duplex capacity, and as I know that my audience in this magazine will be of a widely divergent character, I will endeavour to tell my story from the two aspects.

In August of last year I was assigned to duty on the airship "America," then in course of construction at Atlantic City, N.J. On October 15th, at 8 a.m., the airship left Atlantic City, and by 10 a.m. on the same day I had joined my earth to the equilibrator and opened communication with the station on one of the Atlantic City piers.

The quarters allotted to the wireless apparatus on the vessel were certainly the strangest an operator ever found himself in. Under the main car of the huge dirigible was suspended a lifeboat 27 ft. long, with a 6-ft. beam and 4½ ft. in depth. At each end was a 9-ft. watertight compartment, and the forward one was divided off into a 2-ft. compartment, opening into the cockpit. This was the Marconi cabin. In this space my small set was placed while I worked from the open cockpit.

The Marconi Company had guaranteed Mr



The "America's" Driving Plant.

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Vaniman only a 30-mile radius with the set installed, which consisted of a 10-in. coil (worked from 25-volt accumulators) with a specially constructed loose-coupled jigger, field type of magnetic detector, and a small variable condenser. To recharge our batteries we carried a small 25-volt dynamo, which was belted to one of the main engines. As an antenna we used the main car of the airship, consisting of hundreds of feet of steel tubing, tanks and wire, with a capacity unknown. The celebrated equilibrator, consisting of 40 steel tanks filled with gasoline, threaded on a ½-in. steel cable, which, trailing in the sea, was used as a " ground."

I never experienced such a feeling of joy and relief as I did when " Ax " reported signals good and strong. All the members of the crew had their eyes on me, and all realised what an important part wireless would play in the expedition. Until 4 p.m. on the day of the start I maintained constant communication with Atlantic City, sending bulletins of our progress and receiving encouraging messages and weather reports from the shore. An hour later, although able to read every station along the coast, I was unable to reach any of them. I estimated that we were fully 100 miles off shore, and was particularly pleased with the success of the apparatus so far, and trusted to communicate with incoming liners from Europe during the night. We had departed in a dense fog, and on leaving the hangar, we were lost to view in less than a minute. This fog lasted for two days and nights, and everything was saturated with water. It also added great weight to the lifting capacity of the airship, and resulted in the car flying very low to the water. During the first night we passed three vessels, and almost collided with a big, four-masted schooner, which we missed by less than a ship's length. This was our first " thriller." During the night I repeatedly tried to communicate with vessels, but without success. With the immense aerial I had, the signals came in like hammers, and gave me the impression they were nearer than they actually were.

At 9 a.m. I communicated with Siasconset

The Lifeboat carried by the "America."

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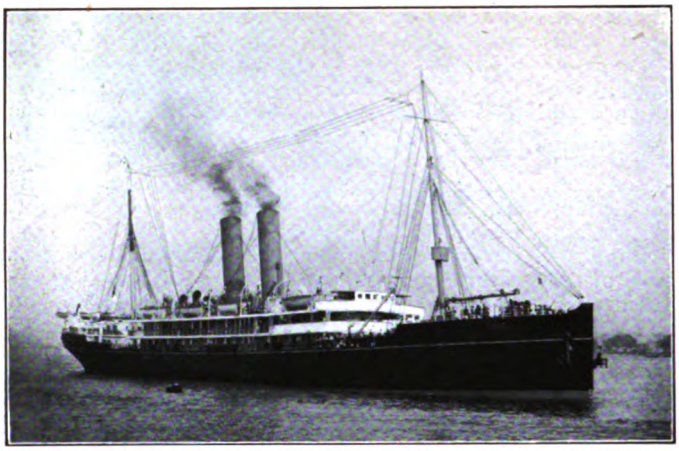
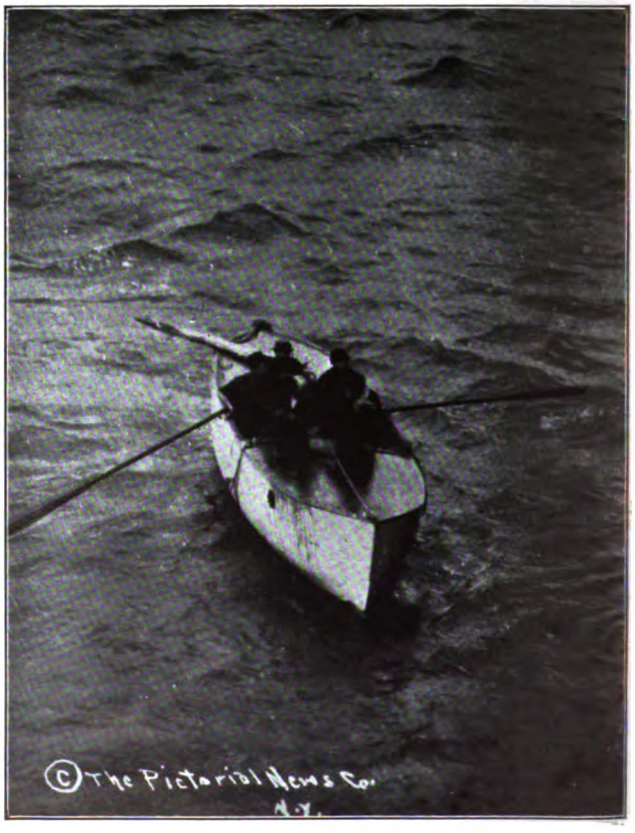


The Royal Mail S.S. "Trent" which answered the call sent out by the "America."

(my old station), remaining in touch with it until 1 p.m. During the previous night a mishap occurred to the engine to which the dynamo was attached, the ball bearings in the shaft being defective, and we were obliged to shut down. I was then unable to recharge my batteries and began to economise on my electric energy. On Sunday afternoon the wind developed into a gale with a very rough sea, and it was then that our troubles began. The constant condensation of fog on our immense gas-bag was still keeping us too close to the water; some of the gasoline was therefore jettisoned, and when night fell the contraction of the hydrogen gas again brought us perilously near the sea. We were forced to throw overboard the now useless engine and dynamo. This relieved the strain of the jerking equilibrator, and the night passed without further danger.

All Sunday night I could hear the steamer "Main," and called at intervals. The vessel appeared tantalisingly close. No one can realise my disappointment when I failed to get in touch with it. At this time we were driving along with a 45-mile wind taking us in a south-easterly direction and out of our course. On Monday, the third day out, the wind slackened somewhat, and took us due south. All prospects of reaching Europe had gone, and we began to think seriously of some way to get back home. Monday turned out to be a beautiful, warm day, and the expanding gas caused the airship to soar thousands of feet skyward, the highest altitude we attained being 11,900 ft. I felt nothing unusual at this high altitude, but had a peculiar ringing sensation in my ears when ascending and descending. Monday night was to prove an eventful one. We had a glorious moon, and all hands stood watch, keeping a sharp lookout for a ship. I heard a Royal Mail boat working during the earlier hours of the night, and realised that she might be bound our way from the West Indies.

At 3 a.m. Tuesday Mr. Wellman called all hands with the glad tidings of "ship in sight." I immediately called C.Q.D. and S.O.S., but received no response. So, seizing an electric torch, I commenced calling in Morse lamp fashion. After some little delay I was answered by the steamer. I



Rowing to Rescue.

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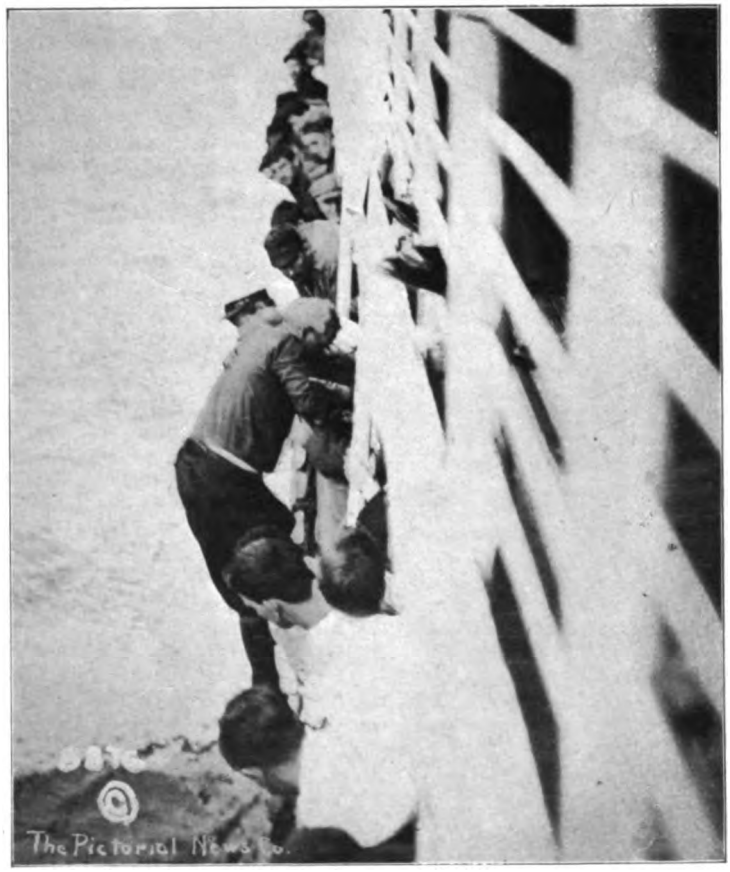
conveyed to them by lamp the fact that we were equipped with wireless, and in a few minutes the most welcome signals I ever heard came hammering in my 'phones.

The steamer proved to be the Royal Mail S.S. " Trent." From this time, until we launched our lifeboat at 8 a.m., we were in constant communication, receiving and sending orders, advice, and suggestions. We were then drifting at the rate of 12 miles an hour, and asked Captain Downs to follow us till daybreak, when we would be better able to see how we could free ourselves from the airship.

The " Trent " was then from 10 to 15 miles distant, and by 7.30 a.m. was alongside. We then informed them by wireless that we would descend and launch our boat. The gas valve was opened, and gradually we descended to the water. When within 6 ft. the boat releases were opened, and she fell beam on into the sea, which was fairly rough at the time. She lurched gunwale under several times, shipping several inches of water. She then righted, and the heavy steel equilibrator struck us as the gasbag shot skywards. It knocked a hole in the air compartment of the boat containing the wireless apparatus. This, however, did not impair the stability of the boat. I also got a stunning blow in the forehead. Before we could recover from this excitement, perhaps the most anxious moment of the three eventful days occurred. The " Trent," about 100 yards away, bore right down on us, making 17 knots. It looked as if nothing could save us from being run down. She missed us, however, and, after a narrow escape from swamping, we fell astern about two miles. The steamer came about and ranged alongside us. Once more ropes were thrown, but she was making too much headway for us to hold them. They next came to us stern on, and in a few minutes we were aboard, boat and all.

The passengers and crew treated us like princes. Two days later we were put ashore in New York. There, to my utter surprise, I found that the modest part wireless had played in the expedition had placed my services in demand in vaudeville, and I was quickly surrounded by competing booking agents. After consideration I signed a ten-weeks' contract at a satisfactory salary. I afterward signed with the Sullivan and Considine circuit to tour the west. I remained on the stage eight months, enjoying a tour of the United States and part of Canada, which seldom comes the way of a " lightning jerker."

In July of this year I returned east, and was offered the position of Marconi operator with Vaniman's new airship " Akron," in which he will again tempt the fates in an attempt to reach Europe by dirigible balloon. I promptly accepted, and am now assisting in its construction. The new airship will be 258 ft. long; it will contain 400,000 cubic feet of hydrogen, and will have a lifting capacity of 13 tons. It will have a total maximum engine capacity of 317 horse-power, and will carry a 3-kw. Marconi set of special construction.



Taking Mr. Wellman off the Lifeboat.

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Mechanical Analogies Applied to Radio-Telegraphy*

By F. W. DAVEY
(of the Post Office Engineer's Department)

IN one's early studies of electrical phenomena, mechanical analogies were frequently of use in giving a material conception of the principles involved. An attempt is made in this article to illustrate by means of mechanical analogies the processes involved in the generation, transmission, and reception of high frequency electrical oscillations, by which means radio-telegraphy is effected. There are two kinds of energy—potential and kinetic. Matter may possess potential energy (energy at rest) on account of its position, and possess kinetic energy (energy in motion) when it is in motion. A charged condenser is the seat of a certain amount of energy, depending in amount upon the capacity of the condenser and the difference of potential to which its plates are charged. If it were possible to completely isolate the condenser, and thus preclude the possibility of slow dissipation losses, the energy of discharge would be the same in amount were the discharge to occur at one hour or one million hours after it had been charged. Although the condenser is a seat of energy, the energy is at rest, ready to do work.

Potential and Kinetic Energy.

It is, therefore, of the potential kind—of the same kind as that of the pile-driver elevated above zero level and kept there until released. When the condenser is discharged it is no longer a seat of energy; the potential energy it possessed has been dissipated, and during the process of discharge a certain amount of work has been performed. Electro-magnetic, lighting, heating, or chemical effects will have been produced in the discharging contrivance. Now, kinetic energy is the necessary concomitant in the process of the performance of work of any kind. The potential energy of the charged condenser has, therefore, been converted into kinetic during the process of discharge. The discharge of the condenser, whether by the piercing of a dielectric or by a current flowing in a conductor connected to the two plates, gives rise to phenomena associated with electro-magnetics. It will therefore be seen that potential energy is associated with electrostatic, and kinetic energy with electro-magnetic phenomena.

Both kinds of phenomena are evidenced across a vacuum without any tangible intervening medium; repulsion occurs between two like charged bodies; the presence of matter between two plates of a condenser is not essential for the mutual action between the two plates. Again, the presence of matter is not essential for the mutual electro-magnetic action between two conductors carrying currents. If, however, matter be introduced between the plates of the condenser, or between the two conductors, the phenomena will vary in amount with the kind of matter introduced. We have therefore to admit that the intervening medium in both cases enters into the action between the two bodies. The dielectric constant of the intervening medium in the former and the permeability of the medium in the latter express the amount by which the action is modified as compared with some arbitrary standard. It is therefore only logical to conclude that in the case of action across vacuum there is some medium intervening by means of which the energy necessary to produce the action is stored or transmitted, as the case may be, and that during such storage or transmission the structure of the medium is modified in some peculiar manner corresponding to the particular form of energy, potential or kinetic, which is present. We have only to turn to the phenomenon of light for a forcible illustration of action between bodies at immense distances and the transmission of energy through space. The light of stars at distances far beyond the limits of the finest instruments of precision and of mathematical calculation is transmitted to this earth. There is action between the matter of the star and the matter of the eye, and a corresponding transmission of the necessary energy, to which phenomenon we give the name of light, and to the medium by which the energy is transmitted through space we give the name of ether. This medium may be defined by its characteristics; that it is the medium whereby certain forms of energy, which are evidenced to us in some particular manner, are transmitted from one place to another, and to that which transmits these forms we give the name of the ether.

* In the July number of the *Post Office Electrical Engineers' Journal* Mr. Davey contributed an interesting article under this heading. The above abstract is made through the courtesy of the editors of our contemporary and the author of this article, to whom we express our gratitude for the facilities offered.—Ed. MARCONIGRAPH.

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We will now consider the kinematics of the method of transmission in the ether by considering the analagous transmission of energy in something more tangible than the ether.

Waves in Water.

The waves in water are known as transverse waves. During the progress of such waves there is no lateral translation of the mass of the water. The wave, consisting of an elevated portion of water and a corresponding depression, travels. Although no lateral translation of the medium in which the wave is propagated occurs, yet energy is transmitted laterally from one part to another by means of the wave. Taking the level of smooth water as an arbitrary level to which to refer the kind and amount of energy in the particles, and neglecting the intrinsic amount of energy which the particles possess at different periods of wave propagation owing to rotation of the particles at these periods, at any instant the mass of water forming the crest of a wave can be said to possess positive, and that forming the base negative, potential energy. These masses, however, are not in a stable condition ; that at the crest falls and that at the base rises, and in so doing the potential energy of the mass is converted into kinetic, reaching maximum velocity, and hence maximum kinetic and zero potential energy at the zero level. The kinetic is then converted into potential energy, which reaches a maximum at the crest and base of a new wave. All these actions are produced by parts of the mass transmitting stresses to adjacent parts with consequent strains. It does not require much observation to see that, whatever action is taking place in a particular part of the mass, the tendency of this action in contiguous parts is to increase the kind of energy in which that part is increasing. For instance, the part which is approaching the formation of a crest in the process of its elevation causes the further depression of that part approaching the formation of a base by elevating the intervening parts between crest and base. This elevation in the case of that part below zero level increases, and in the case of that part above zero level decreases the kinetic energy, with the corresponding decrease or increase of the potential energy. A word of warning should perhaps here be added, inasmuch as the principles of wave motion outlined above do not express the whole of the processes involved in wave propagation. The potential and kinetic energies in a particular particle are co-existent, and reach maximum and minimum values at the same times ; in fact, this condition is essential for wave propagation. The consideration, however, of the rotation of the particles themselves, and the consideration of the energy of the particles without reference to the arbitrary zero level which we have premised, both of which are involved in the actual processes, are too complicated to admit of treatment from the simple point of view of analogy.

What is Wave Motion.

It is herein that the analogy cited, in common with all analogies, fails. With this reservation, therefore, we can say, from our point of view, that the principle of wave motion consists of an alternation of the kind of energy in the mass, and also that energy is transmitted from one place to another by means of these peculiar alternations in the form of energy in the medium, and the consequent stress and resulting strains.

If alternations of the energy associated with a charged condenser and electro-magnetic energy can be produced at a certain point, energy will be transmitted in the ether to a distance in somewhat the same manner that energy imparted to a mass of water is transmitted from one place to another. Let us consider the manner of producing the necessary alternations by considering another mechanical analogy. Imagine a weight attached to the lower end of a spiral spring which at its upper is attached to a rigid support. Stress is exerted upon the system by pulling the weight down and extending the spring, or pushing it up and compressing it, and then releasing it. The weight will then perform a certain number of oscillations per second ; or, referring again to our water analogy, the energy of the system will alternate in kind between potential and kinetic, in the same manner as the particles of water in their up-and-down motion did in the propagation of a wave. Now the number of oscillations per second which the system will make, or the number of alternations in the kind of energy that will occur, is dependent upon two factors—the resilience of the spring and the inertia of the weight ; by varying one or both of these the number of vibrations per second, and hence the time period of oscillations, will vary correspondingly and according to some definite law. The time period of oscillation can be varied in another manner.

The Effect of Friction.

Hitherto we have neglected friction. Suppose the weight to be immersed in a viscous fluid—treacle, for instance—the time period will not only be longer, but the number of oscillations performed per second will consequently be much less than formerly. Moreover, the ratio of amplitude of the second to the amplitude of the first oscillation under these conditions will be much less than was the case when the weight oscillated in air. The resistance of the fluid to

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change of shape, resulting in friction upon the mechanical system, has damped the oscillations; it will readily be seen that when the friction exceeds a certain amount, the weight will not oscillate at all, but will slowly return to its position of equilibrium. The motion is completely damped, and is now aperiodic. With damped oscillation some function of ratio of the amplitude of the first to that of the second oscillation will express the amount of damping that occurs. This function is known as the decrement factor. Suppose an electrical system to be composed of a condenser in series with a conductor which, from its geometrical form, possesses induction, and, from its nature as a conductor, resistance. We have here the electrical counterpart of our mechanical system in which damped oscillations result from a force impressed upon it.

Alternations of Energy.

In spark radio-telegraphy the electrical force is impressed by means of a spark-gap, across which an electro-motive force is built up before the dielectric gives way to provide an electric oscillating current—that is, an electrical force is impressed, and then the system is released and left to oscillate. The system then consists of the spark-gap (whose resistance during oscillation is not more than a few ohms), a condenser and a conductor having inductance and resistance all in series. Along the conductor the medium, which we will call the ether, will have impressed upon it energy alternating between the kinetic and the potential. The condenser is charged (potential energy) then discharges (kinetic energy), but—because of the electrical inertia in the system—overshoots the zero position, and the kinetic energy of discharge is converted, in part, into potential energy, opposite in sign to the original form of potential energy. Another discharge occurs, and the processes are repeated until the electrical oscillations are damped out by the resistance. How, then, are these alternations between potential and kinetic energy impressed upon the ether in such a manner as to give rise to wave propagation? It is purely a matter of time occupied in the process. When a circuit carrying a current is broken the whole energy surrounding the conductor, that is, the electro-magnetic field, collapses into the system, and, if sufficient in amount, will be evidenced at the break by a spark. This collapse of energy from the ether into the conductor is due to the slowness with which the electrical change tal es place on account of the damping character of the resistance, which, in ordinary circuits, greatly exceeds the critical value at which electrical oscillation ceases. When, however, the time occupied is small, part of the energy, instead of collapsing into the system, will radiate into the ether in the form of waves. Let us turn again to our water analogy. Suppose a pointed stick to be slowly immersed in a mass of water, and then to be slowly withdrawn; no wave motion is brought about; the whole energy expended in the process is frittered out into heat which is dissipated in the mass of the stick and the water; this is the mechanical analogy of the ordinary modification of the structure of the ether produced by a conductor in which the electrical changes are slow, and therefore non-oscillatory in character.

Wave Length.

It may be opportune to deal with the question of wave length in connection with a radio-telegraphic installation. It has already been stated that the velocity of propagation of wave motion in the ether is 3 metres by 10^8 metres, or 186,000 miles per second, and we have also seen how the velocity of propagation is equal to the product of frequency of oscillation and wave length. The frequency of electrical oscillation has been shown to be, neglecting friction, a function of the capacity and inductance of the system. Therefore, as wave length is the ratio of velocity of propagation to frequency of oscillation, the adjustments of a radio-telegraphic installation may be expressed as a wave length in units arbitrarily chosen. For instance, when a radio-telegraphic station is said to work on a 600-metre wave, we mean that the capacity and inductance of the oscillating system are so arranged as to produce a frequency of oscillation that the ratio 3 by 10^8 to that frequency is 600.

It may be of advantage, in conclusion, to summarise the processes involved in radio-telegraphy.

At the sending station electrical oscillations are generated by means of an electrical system of certain capacity and inductance; the frequency of the oscillations will depend upon the value of these factors. Energy, alternating in kind between potential and kinetic, in the form of waves, is radiated into the ether from an electrical appliance known as the aerial linked to the system. These alternations of energy deliver a succession of electrical blows to a similar electrical appliance in the path of the waves; an electrical system of capacity and inductance is attached to this appliance having the same electrical frequency as that of the originating system. Electrical oscillations are thus generated, transmitted across space, and reproduced at a distance. A form of apparatus, known as a detector, in which the electric oscillations produce certain magnetic, chemical, or heating effects, is all that is then required to effect communication between two points without the intervention of a material conductor.

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Wireless Telegraphy in Spain

A VERY important and interesting development in wireless telegraphy is effected by the completion of installations at Cadiz, Las Palmas and Teneriffe.

Official trials on behalf of the Spanish Government were carried out recently by a Royal Commission.

During the trials the following message was sent by Marconi's Wireless Telegraph Co., Ltd., to the Commission from the station at Poldhu :

" To the president and members of the Royal Spanish Commission for Wireless Telegraphy, Cadiz.

" The Marconi Co., in sending to you this message commemorating the occasion of the first exchange of wireless telegrams between Spain and England, offers to you its respectful salutations, and ventures to express the hope that the new means of communication thus afforded between the two countries may have the happy result of furthering their common interests."

And the following reply was received :

" La comision española estima en cuanto vale su cariñoso saludo al que corresponde con el afecto y respeto que le merece quien en bien de la humanidad trabaja con tal ahinco y le satisface muchisimo que la telegrafia sin hilos motive nuevos lazos de union con pais tan progresivo, reiteramos nuestro respetuoso saludo." Which may be translated as follows :

" The Spanish Commission appreciates fully your cordial greeting, and responds with the affection and respect that one who works so earnestly for the welfare of humanity deserves. The Commission is much gratified that wireless telegraphy should form a new bond of union with such a progressive country. Reiterating our respectful greetings."

Much interest has been excited in Spain, and the Spanish newspapers publish enthusiastic articles upon the highly satisfactory result of the tests.

Space will not permit of the publication of more than the following translation of an extract from *El Liberal* of October 8th, which, however, can be taken as characteristic of the articles in the Spanish Press generally :

" WIRELESS TELEGRAPHY.

" Cadiz, 7th (1.28 a.m.).

" An official Commission has arrived in the s.s. ' Hesperides ' in order to test the communication with the wireless stations of the Marconi system at Las Palmas and Teneriffe. It is composed of D. Jose Camino, D. Jose Sandoval (first officer), and is accompanied by D. Guillermo Ortega (first engineer of the Company).

" Mr. Vyvyan, of the Marconi Co., who was to have accompanied the Commission, had to remain in the Canary Islands owing to illness.

" Excellent results were obtained from the trials in the Canary Islands at Las Palmas and Teneriffe.

" Communications were exchanged with the stations at Cadiz, Barcelona, Poldhu (England), and with ships at sea, at a distance of 600 k.m. ; the steamers were ' Routhine,' ' Amazonas ' and ' Oropesa ' : the former transmitted a message to a Cadiz merchant.

" The trials at the Cadiz station consisted of communication with Barcelona, with the military station at Carabanchel, Palma and Teneriffe, and with ships passing through the straits (Gibraltar) on their way to America. The range of the station is 1,600 k.m.

" The Commission will report that it trusts the Government will speedily authorise the opening of the Public Service, for it will be of great convenience to Spain, as rapid communication with the whole world will thus be attained.

" It is proposed to establish a world-wide Press Service for the Spanish newspapers, and the rates are under consideration. The station at Cadiz will be utilised for such Press service."

The installation at Barcelona has been completed, and the trial by the Royal Commission has proved equally successful.

Wireless Telegraphy in India

ADVICES from Simla report that good progress is now being made with the new wireless telegraphy system, which will be worked from Calcutta, Allahabad, Delhi and Jutogh (Simla) stations. The apparatus at Jutogh will be practically ready within a month, and the other stations should have completed their arrangements by December. It is hoped, indeed, that the system will be brought to such a state of perfection that messages will be exchanged between His Majesty's cruiser squadron after it leaves Aden at the end of November and the wireless station at Delhi.

In our December issue we propose to deal fully with the Indian stations, which are being erected by Marconi's Wireless Telegraph Co.

A cable has been received from Chili advising the acceptance of the tenders of Marconi's Wireless Telegraph Co., Ltd., for the erection of a number of important stations for the Chilian Government.

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Wireless on Land and Sea: The Post Office Record.

THERE is a singular dilatoriness about the appearance of official publications which exasperates the layman. It is true that the publications of the monthly overseas trade returns of Great Britain by the Board of Trade, on the seventh day following the close of the month to which the returns relate, is a wonderful exception. Indeed, we doubt whether this record for promptitude is equalled in any other country. We only wish that other Government departments (and, let us add, the Board of Trade, too) would emulate this brilliant example, and so render more modern the valuable and interesting reports that flow in an incessant stream from His Majesty's Stationery Office. Having indulged in this little grumble, we may now turn to that fertile source of information—the fifty-seventh report of the Postmaster-General on the Post Office, for the year ended March 31, 1911—which first saw light in the middle of October. The public have already been made acquainted with the developments intended to facilitate and cheapen internal communications, and we need only add that these developments indicate a praiseworthy alertness on the part of the chiefs of the Post Office to adapt the great organisation of which they have charge to the ever-changing needs of our complex social and commercial order.

The report reflects to some extent the great advances made within recent times in wireless telegraphy. The benefit which these developments have conferred upon the Post Office is seen in the increased number of messages passing through the coast stations, the improved facilities, reduced charges, and the long-distance service made possible through the efforts of the Marconi Company. The number of radio-telegrams dealt with at the Post Office coast stations during the year shows a satisfactory increase, the outward radio-telegrams to ships reaching a total of 5,640, as compared with 3,266 in 1909–10, and inward radio-telegrams from ships 34,161, as compared with 27,727 in 1909–10; the total increase being 8,808, or 28·4 per cent. This increase is mainly attributable to the larger number of ships communicating with wireless coast stations. In addition to the Atlantic and other liners, most of the cross-channel passenger vessels and many cargo ships now carry wireless telegraph apparatus; and in view of the advantages to the shipping community afforded by the wireless service, there appears to be every probability that the number of ship installations will continue to increase at a rapid rate. Reference need only be made to the Maritime Section of THE MARCONIGRAPH to see how this prediction is being fulfilled.

The Post Office stations at present open for general correspondence with ships at sea are as follows: Caister (Norfolk), North Foreland (Kent), Niton (Isle of Wight), Bolt Head (Devonshire), Lizard (Cornwall), Seaforth (Lancashire), Rosslare (Wexford), Crookhaven (Cork), and Malin Head (Donegal). The expanding service has shown that in order to meet adequately the requirements of shipping, especially in the North Sea and at the western entrance to the English Channel, a reorganisation of the coast stations is necessary, and the expenditure of £16,000 for this purpose has been authorised. Two additional stations are to be provided; one of medium range (about 250 miles) will be situated at or near Newcastle-on-Tyne. The other station, which will have a range of about 500 miles, will be erected in the neighbourhood of the Island of Valentia to serve the rapidly increasing traffic to and from ships passing the south-west of Ireland. A new station will also be erected at Land's End, with an approximate range of 250 miles, to replace the existing station at the Lizard. The existing stations at Malin Head and Niton will be removed to more convenient positions in the neighbourhood, while that at Rosslare will be transferred to a position on the Welsh coast in the neighbourhood of Fishguard. In each case the efficiency of the stations will be increased by the introduction of improved apparatus.

To encourage the exchange of radio-telegrams with ships making short voyages, a new scale of coast station charges has been introduced, and there is every reason to think that the reductions will be appreciated by passengers making short sea voyages. Of great importance is the fact that arrangements were recently made for accepting radio-telegrams at Post Offices for transmission at the rate of 3s. a word by way of the Marconi Company's long-range station at Poldhu, in Cornwall, when the ships for which they are intended are beyond the range of the Post Office coast stations. The effect of this is that it is now possible to communicate from any Post Office in the United Kingdom with the large Atlantic liners fitted with Marconi long-distance apparatus, at any time during their voyage between this country and Canada or the United States. All this is leading to the time when a person will walk into a Post Office and be able to send off a radio-telegram to his friends on board a steamer in mid-ocean, and receive a prompt reply by the same means. The ocean waves may separate a man from his friends at home, but the electric waves over which Mr. Marconi has gained the mastery will form a bridge over which uninterrupted communications will flow.

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Wireless in Warfare

THE past month has been a notable one in the history of the world, and is likely to leave an important impress upon the future. No sooner had the dark clouds of war cleared away from Morocco than a storm suddenly occurred off the coast of Tripoli, to give way in turn to an even greater tempest in China. Policies that make or avert wars, or strategems that carry them through are no concern of ours. What we are concerned with is the rapidity and reliability of communications, which is of the greatest possible importance alike to those engaged in war and to the great public outside the arena. We have an illustration of the unreliability of ordinary telegraphic communication in China, where much time elapses before long-expected news can be communicated owing to the cutting of cables. In Tripoli there has so far been no decisive engagement to confirm the great value of wireless telegraphy in warfare. The Italian troops are well equipped in this respect, and some of the newspaper correspondents in Tripoli refer to the ease with which communications were maintained between the attacking fleet and the army inland. It is of interest to recall here the successful trials made in Turkey with Marconi field apparatus, and described in the October number of THE MARCONIGRAPH.

During the bombardment of Derna by the Italian fleet a wireless telegraph station at that place was destroyed. This raises a question as to the location of such stations which should be faced now, and that is, whether in view of the ease with which an attacking fleet might be able to demolish coast stations, it might not be advisable to erect these further inland. With the long range of communication now possible with the Marconi system this should not be an insuperable difficulty.

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It is understood that three stations will be erected for the French Government along the coast of France from which Hertzian wave fog-signals will be transmitted. Each station will emit a distinctive telephone note every thirty seconds, and repeat during ten seconds a letter of the Morse telegraph code. The telephone notes selected for the three stations correspond to given wave-lengths or frequencies.

A view of one of the Marconi's Wireless Telegraph Company's Stands at the Olympia Exhibition.

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Reviews of Books

"THE POST OFFICE AND ITS STORY," by Edward Bennett. (London: Seeley, Service & Co., 5s. net.)

The Post Office is one of the great Government departments which affects us all intimately. We notice evidences of the existence of other departments around us, and at times we are brought into relation with them, but the efficiency of the Post Office is a matter which touches us nearly every day of our lives. Consequently, the history of this most familiar of departments is of general interest. A full history of the Post Office, however, Mr. Bennett is not concerned to give, as it is his object rather to give a description of the all-embracing work of the department to-day. The book confirms the impression which is now widely held that the Post Office is in close touch with the needs of the nation, and is in less danger of being strangled with red-tape methods than at any time of its existence. Nevertheless, Mr. Bennett devotes chapters to the early days, when letters were carried by mail coaches, to the inauguration of the penny post, and the extension of the service while it emanated from St. Martin's-le-Grand. This arrangement, if it suffers in purely historical value, is from the point of view of general interest a wise one. In the sixteenth and seventeenth centuries the mails were carried by runners or post boys on horseback. The maximum speed for the post-boys allowed by the Master of the Posts was seven miles an hour, but the speed rarely exceeded four miles per hour. The temptations of the wayside inn often also explained the long delays, and an official in the early part of the eighteenth century complained that "the gentry doe give much money to the riders whereby they be very subject to get in liquor which stops *the males*." What we wonder, would the modern postman think of the attempt to frighten him into the performance of his duty which the Government of earlier days had to do to his predecessor. Mr. Bennett recalls some of the devices adopted to make the lazy postboy hurry. "Ride, villain, ride —for thy life—for thy life—for thy life" appeared often on letters, with sketches of a skull and cross-bones, or of a man hanging from a cross-bar. Some of the personal touches in Mr. Bennett's book are delightful. It is well known that the Post Office has had in its service men of great literary eminence—men of letters in the double sense. Anthony Trollope began his career here, and a difficult official he was to deal with. Edmund Yates also worked at St. Martin's-le-Grand, and Mr. Bennett tells a good story of Yates himself. The Post Office Library was founded in 1858. There were many unredressed grievances among the clerical staff in those days, and when Rowland Hill undertook to give a lecture on astronomy to the library subscribers, a practical, if somewhat unfair, opportunity seemed given to the clerks to bring their necessities before the chief. Hill asked for a shilling from his audience in order to illustrate an eclipse. He wished to pass it between the eye and a lamp. Busy fingers went diving into pockets and purses for moons. After two or three minutes' waiting, the lecturer beheld an array of blank faces and shaking heads, and he naturally looked puzzled. Then Edmund Yates arose. "I beg to explain, sir, that we are all very anxious to try the experiment which you suggest, but unfortunately we cannot find a shilling among us." On the whole, we may wonder what type of man Sir Rowland Hill found most trying to deal with at the Post Office, the man of genius or the hidebound official.

In the description of the new King Edward's building, Mr. Bennett explains the up-to-date methods of transmission, the parcel post, and the telegraph and telephone systems with sufficient detail to convey a fairly complete idea of the influence of the postal service on the social life of the community. With regard to wireless telegraphy, Mr. Bennett remarks that not many years ago the statement that it might be possible to transmit and receive telegrams to and from ships at sea would have been received with incredulity. That this is not now merely a wonder, but a wonderful fact, is shown by Mr. Bennett, and even in a more striking manner by the Postmaster-General in his annual report, which, by a curious coincidence we deal with in this issue. The book is illustrated with excellent photographs, and is interspersed with amusing anecdotes of occurrences which must have left the officials rather doubtful of the intelligence of some of their customers. Mr. Bennett is to be congratulated on having written a book which is full of interest and varied humour, and which the publishers have produced in a manner worthy of the text.

"HINTS FOR WIRELESS DESIGNS FOR AMATEURS," by Alfrec. (London: The *Electrician* Printing and Publishing Co., Ltd., 1s. 6d. net.)

This little book is intended solely for the use of amateurs, and is therefore off the beaten track of such books. The author introduces any type of design or circuit that in his opinion is easy and practical, and the resultant sets, both sending and receiving, are rather different from the usual types. The amateur who desires to undertake the manufacture of a wireless installation will be able to gather much useful information from this simple handbook.

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Long-Distance Communications

A PAPER by Mr. L. W. Austin, entitled "Some Quantitative Experiments in Long-Distance Radio-telegraphy," has recently been published in the Bulletin of the Bureau of Standards in the United States. Mr. Austin has investigated the relationship between the current in the receiving aerial and the distance between the transmitter and the receiver, the observations being made mainly by the shunted telephone method. Mr. Austin puts forward the proposition that the current in the receiving aerial varies inversely with the distance, except that in long distances it is necessary to take into account the absorption. He puts forward the following formula, which contains an expotential term to allow for this. The complete formula giving the received current I_R in terms of the transmitted current I_S, the heights of the two antennæ $h_1 h_2$ the wave-length λ and the distance d, is

$$I_R = 4{\cdot}25 \frac{I_S h_1 h_2}{\lambda d} e^{-\frac{0{\cdot}0015 d}{\nu \lambda}}$$

There are many obscure points in the long-distance transmission which Mr. Austin's formula does not account for; for instance, Mr. Marconi pointed out at the Royal Institution recently that there were two minima near sunset and sunrise in the curve representing the strength of the received signals across the Atlantic, and also two maxima. Can this be accounted for purely by variation in the absorption coefficient, and, if so, does the absorption coefficient during the minima bear the same relationship to the wave-length as that given in Mr. Austin's formula? Do the two maxima correspond to practically no absorption, or are they higher values than would be obtained if no absorption existed as if waves were concentrated, as Mr. Austin seems to consider possible?

Control of Submarines

EXPERIMENTS are reported to have taken place at Portsmouth in connection with a device for controlling submarines and torpedoes by means of Hertzian waves. It was fitted to one of the old submarines of the "Holland" type, and tests were carried out by officers of H.M.S. "Vernon," torpedo school, at Portsmouth. The experiments were strictly confidential, but the results are said to have proved satisfactory, as the submarine was under the control of the wireless instrument operators while on the surface. Further tests are to be carried out with a submarine fitted with this device while submerged. No one was on board the vessel at the time, and the movements of the submarine were controlled at some distance from it. It has always been recognised that the officers and crews of the vessels would run enormous risks in time of war, but these will be minimised if submarines can be operated and their torpedoes discharged from the mother ship, lying several miles away, or from a station on shore.

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A notable development of the uses of wireless telegraphy is announced in France, where, according to reports in the Press, the Ministry of Marine have decided to equip submarine vessels with apparatus for wireless telegraphy. It is the vessels which will be used for the purposes of attack that are likely to derive the greatest benefit from this development. It is regarded as being of the utmost importance that these vessels should be able to communicate regularly with the remainder of the fleet, and thus record the success or otherwise of their operations.

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The Editor will be pleased to receive contributions; and Illustrated Articles will be particularly welcomed. All such as are accepted will be paid for.

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The Share Market.

Since our last number the activity in Marconi wireless shares has continued.

The closing prices on October 26th (the date we went to press), which show considerable improvement, were as under:

Ordinary	49s. 6d.	50s. 6d.
Preference	38s. 9d.	40s. 0d.

Marconi's Wireless Telegraph Co., Ltd., have commenced an action against Messrs. Siemens Brothers & Co., Ltd., for the alleged infringement of their patents Nos. 11,575 of 1897 and 7,777 of 1900.

Messrs. Siemens Brothers & Co. are offering to instal the system known as the "Telefunken System," which Marconi's Wireless Telegraph Co., Ltd., allege to be an infringement of the above-mentioned patents.

Similar proceedings are about to be instituted in other countries.

The Marconi Company take over the Lodge-Muirhead Patents

The action commenced some little time back against the Lodge-Muirhead Syndicate for alleged infringement of Marconi's 7,777 patent, and the proceedings commenced by the Lodge-Muirhead Syndicate against the Marconi International Marine Communication Co., Ltd., for alleged infringement of the Lodge-Muirhead patent have been withdrawn, a friendly arrangement having been arrived at between the companies by which all the Lodge-Muirhead patents become the property of Marconi's Wireless Telegraph Co., Ltd., and Sir Oliver Lodge becomes associated with the Marconi companies as a scientific adviser.

The most important, perhaps, of the Lodge-Muirhead patents is No. 11,575 of 1897, which has just been extended by Mr. Justice Parker for a period of seven years.

Visit to the Marconi Works.

About sixty members of the Association of Engineers-in-Charge recently made an inspection of the works of Marconi's Wireless Telegraph Co., Ltd., at Chelmsford. They were accompanied by the president, Captain H. Riall Sankey, R.E., M.Inst.C.E., and a director of the company, through whose instrumentality the visit had been arranged. Mr. C. Mitchell (works manager), Mr. H. M. Dowsett (chief of the testing department), Mr. A. Eddington (assistant works manager), and Mr. H. J. Worrall (of the testing staff) acted as guides, and the engineers were conducted around the works in four parties.

Mr. A. E. Penn, on behalf of the Association, in proposing a hearty vote of thanks to Captain Sankey and to the directors of Marconi's Wireless Telegraph Co., remarked that they had all spent a most instructive afternoon. What they had seen had opened their eyes as regards the wonders of wireless telegraphy.

Captain Sankey, Mr. Mitchell, and Mr. Dowsett responded.

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Extraordinary General Meeting of Marconi's Wireless Telegraph Co., Ltd.

(Reprinted from *The Times*.)

AN extraordinary general meeting was held on Wednesday, 25th October at the offices, Watergate House, York Buildings, Adelphi, W.C., for the purpose of considering a resolution to increase the capital by the creation of 250,000 new Ordinary shares of £1 each. Mr. Godfrey C. Isaacs presided.

The Secretary (Mr. Henry W. Allen) read the notice convening the meeting.

The Chairman said: "I am taking the chair to-day in consequence of the fact that our chairman, Mr. Marconi, is abroad transacting some important business on behalf of the company. The notice which you have received informs you that this is an extraordinary general meeting called for the purpose of considering, and, if thought fit, passing, a resolution to increase the company's capital by 250,000 Ordinary shares of £1 each, ranking *pari passu* with the Ordinary shares of the company previously authorised and issued. It is owing to the considerable development of wireless telegraphy throughout the world, and the immense business which this company is, and will be, called upon to conduct, that your directors are determined that they shall not be handicapped by insufficient capital in turning to the fullest account the fresh opportunities offering in this great scientific industry. Of this, perhaps, no better illustration can be cited than that of Russia. In that country, and in the East generally, there is a big field for development, and in order to be thoroughly equipped to cope with the work in that vast territory we have secured the controlling interest in the Russian Company of Wireless Telegraphy and Telephony. This is a company which has been in existence for some two or three years, and is carrying out large contracts for the Russian Government, and are negotiating for further contracts of considerable magnitude with the Russian War Office, with the Marine, and with the Post Office. Captain Adrian Simpson, a member of our staff, in whose ability and integrity we have implicit confidence, has been appointed managing director of the Russian company, and Mr. Marconi and I are joining the board. Under Captain Simpson's direction we are confident that a handsome revenue will accrue to us from this new field of action. In other parts of the world we are conducting negotiations which should mature in the early future, and will require considerable financial resources.

"The general development of commerce throughout the world is producing, as a natural corollary, a considerable increase in telegraphic communications. In this direction, also, there is a field of great magnitude of which this company will secure its share.

"THE COMPANY'S EARNING POWER.

"We are satisfied that the additional resources for which we ask the authority will be productive of such increased profits to the company that both the Preference and Ordinary shareholders will be substantially benefited. The Preference shares, which have a first claim upon both capital and interest, add materially to the value of their security, and inasmuch as they participate also in the dividends over and above their cumulative 7 per cent. so soon as the Ordinary shares have received 10 per cent., they have everything to gain by increasing the earning power of the company, and inasmuch as the additional capital should be the means of our earning considerably more than sufficient to provide reasonable dividends upon the shares which it will represent, the existing Ordinary shares must equally reap considerable advantage. We are on the eve of world-wide recognition of the utility of Mr. Marconi's great invention, which is rapidly building for us a business of vast proportions of a sound industrial nature. When our chairman addressed you at our general meeting in July of this year he was able to tell you that we had made great strides since the preceding meeting, and that our work was rapidly increasing. So far as we could then gauge we had at our disposal all the financial resources which our prospective work demanded, and although fully anticipating a big increase in our business, we were scarcely prepared for the rapid expansion which is now promising in all parts of the globe.

"AN IMPERIAL WIRELESS SCHEME.

"You will be pleased to learn that we are in active negotiation with our Government in connection with the great scheme of Imperial wireless stations, and we hope that the near future will enable us to announce to you that the construction of these stations is about to be commenced. It will also interest you to know that we have just received a cable from Chili informing us that our offer for the construction of a number of stations for the Chilian Government has been accepted. It will, no doubt, be a matter of satisfaction to

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all our shareholders, as it has been to Mr. Marconi and to the other members of the board, that we have been able to arrive at a settlement of all our differences with the Lodge-Muirhead Syndicate, and that we shall henceforth have the advantage of Sir Oliver Lodge being associated with our company as a scientific adviser. By this arrangement we have broken the back of the litigation through which it was necessary for us to pass. There remains little more to be done in this direction in this country. If this meeting approves the resolution which I shall shortly formally submit, and if this resolution be confirmed at the meeting summoned for November 9th next, your directors will quickly proceed to make the necessary arrangements for the issue, fixing the premium at which the new capital will be issued. Shareholders may, however, rely that these terms will provide for a reasonably substantial bonus to both Preference and Ordinary shareholders alike. We have received a very large number of proxies and expressions of approval from a great many of our shareholders, and I am glad to say we have not had a single dissenting voice. I now formally propose the following resolution: 'That the capital of the company be increased by the creation of 250,000 new Ordinary shares of £1 each, to be issued on such terms and conditions as the directors think fit, such shares to rank *pari passu* in all respects with the existing 500,000 Ordinary shares of £1 each.'"

Major S. Flood-Page seconded the resolution.

Mr. Goodbody asked whether it was the intention of the directors to issue the whole of the proposed new capital at once.

The Chairman, in reply, said that he could hardly answer the question at the moment. He thought the matter had better be left to the directors to deal with after the confirmatory meeting.

Mr. F. M. David inquired whether any part of the proposed new issue would be devoted to relieving the practical isolation of the Poldhu and Glace Bay stations.

The Chairman stated that a portion of the proposed new capital would undoubtedly be used for the purpose of creating a telegraphic service with a number of stations which they would be erecting, and were erecting, elsewhere. He did not think that he could give further particulars in regard to that matter.

Mr. Horace Smith asked what proportion the Preference shareholders and the Ordinary shareholders would be entitled to subscribe.

Mr. Goodbody stated that he had tested the station that had been opened at Galway, and had found it to be exceedingly satisfactory. (Hear, hear.) There had been times when the messages had been delayed, but his experience was that when he sent a message by wireless fairly early in the morning he usually got a reply by 6 o'clock at night.

The Chairman stated that he had no doubt they would be able to even improve upon that.

The Hon. D. O'Brien said that, speaking as a stockbroker in London, the wireless system, although not so very largely used, had worked satisfactorily.

The Chairman, in reply to Mr. Horace Smith, said that the Preference and Ordinary shareholders would be treated on an equal basis in regard to the new issue of shares. Each would have the right to subscribe in the same proportion.

A Shareholder: At what price will the shares be issued?

The Chairman said that that matter had not yet been settled, but when the shareholders authorised the issue the directors would then determine at what price the issue would be made.

Mr. W. J. Purdy said that, with regard to the despatch of messages by the wireless system to America, he had been in communication with quite a number of users, all of whom had expressed their satisfaction with the system. (Hear, hear.) At times there had been some little delay, but it was not sufficient to prevent them using the system.

The resolution was then put to the meeting and carried unanimously, and a vote of thanks to the Chairman concluded the proceedings.

Marconi's Wireless Telegraph Co., Ltd., was awarded the Diploma of Grand Prix for its exhibit in Class 31 of the Turin International Exhibition held this year.

The company's exhibit included a 5 k.w. ship installation and sundry wireless testing instruments.

Benevolence

WE are grateful to our readers for the ready response which they have made to our appeal for funds for Mrs. McIntyre and Mrs. W. J. Croxon. The sum of £10 11s. has already been handed over to Mrs. McIntyre. For Mrs. Croxon we received the following sums during the past month: Anonymous, £1; Messrs. Heybourn & Croft, 10s. 6d.; Mr. J. Cave, 2s. 6d.; total, £1 13s.

Elsewhere we note that Mr. Marconi will preside at the annual dinner of the Newsvendors' Benevolent and Provident Institution, on Monday, November 27th. We hope to refer to this most deserving institution in a later issue. Meanwhile we trust that our readers will help to further the success of the appeal which is being made by Mr. Marconi on behalf of distressed newsvendors.

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The Marconi Wireless Telegraph Company of Canada, Ltd.

THE annual meeting of the shareholders of the above company was held at Montreal on October 5th, and we give below some extracts from the directors' report which was presented to the meeting :

Twenty-nine stations are now owned or controlled by the Company in the Dominion of Canada and Newfoundland, situated at the following places : Indian Harbour, Domino, American Tickle, Venison Island, Battle Harbour, Belle Isle, Point Amour, Point Rich, Harrington, Heath Point, Fame Point, Clarke City, Father Point, Grosse Isle, Quebec, Three Rivers, Montreal, Magdalen Islands, Cape Bear, Pictou, North Sydney, Cape Ray, Cape Race, Sable Island, Cape Sable, Halifax, St. John, Port Arthur (Ontario), Glace Bay (C.B.) For the stations controlled for the Canadian and Newfoundland Governments the Company receives a subsidy, and, in addition, the total receipts from telegraph business. These traffic receipts have continued to increase. For the year ending January, 1909, the receipts amounted to $19,200 ; for the year ending January, 1910, $36,100 ; for the year ending January, 1911, $42,630, and a proportionate increase is expected for the current year.

The number of vessels now equipped with the Marconi system is five hundred and thirty-six ; of these two hundred and twenty-three large passenger steamers ply regularly on the North Atlantic route, and communicate with the magnificent system of stations established in Eastern Canada. Many of these steamers are in communication with the Company's system for three days before arriving at and after leaving port.

Negotiations with the Canadian Government regarding the terms of a new contract have recently been concluded. Under this contract the Government have purchased three of the stations, and a substantial increase in the subsidy for the control of all stations owned by them has been made.

The development of the Marconi system through the Great Lakes has been commenced by the establishment of a station at Port Arthur, Ontario, and the equipment of three vessels owned by a Port Arthur company, and further extensive developments it is expected will be carried out at an early date, and your directors will make every effort to secure the contract for the controlling of the Canadian Government stations now being erected on the Great Lakes ; and they have also every reason to believe that these stations will be entirely equipped with Marconi apparatus.

The Newfoundland Government desire to further extend their system on the Labrador by three stations. These stations are now being erected under the terms of the existing agreements, but other terms beneficial to both the Newfoundland Government and this Company have been suggested, and we hope these terms will be finally accepted by the Newfoundland Government in lieu of the terms of the existing contracts.

A Word to the Unwary.

Exaggeration bears a close resemblance to misstatement, and it is therefore necessary to utter a warning against the ready acceptance of the wonderful tales of phenomenal achievements in modern telegraphy or telephony which are served up for public delectation. One of the latest of such alleged " achievements " emanates from San Francisco, where, according to inspired newspaper accounts, " the wireless operators there [San Francisco] exchanged for the first time messages with Japan over 6,000 miles of ocean." The inference to be drawn from a statement of this kind is clearly that the difficulties in establishing such long-distance communication have been overcome, and that the thing is a *fait accompli*. We will not attribute to the originators of the report to which we have drawn attention the desire to mislead, for no one who understands anything about radio-telegraphy can be deceived by such a statement. But the effect upon the public mind is certainly mischievous, inasmuch as it tends to spread erroneous information concerning wireless telegraphy. Or it might happen that a message could be transmitted over such a long distance, by communicating from shore to ship that happened to be in the way, from ship to ship, then from ship to shore again. Even that would depend upon atmospheric and other fortuitous conditions. Such an achievement is therefore a " freak," and could not be repeated until some entirely unforeseen or chance circumstances occurred to help it. What the intelligent public desire to know is what reliable results have been obtained from scientific investigation, and how these results are applied to practical ends. Any other information should be taken with an abundant supply of salt.

Apropos the statement in a recent issue of THE MARCONIGRAPH that a prosecution was recently entered in America against an amateur wireless operator for intercepting a message destined for the *Los Angeles Herald*, the court has now held that no offence had been committed by the amateur or by the paper which published the message. This decision, if allowed to stand, creates a dangerous precedent against which the wireless companies will probably appeal.

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Marconi Field Stations in Siam

[The Rome agency of the Marconi's Wireless Telegraph Co. recently obtained an order from the Siamese Government for the supply of four wireless field stations, which were delivered in good time, and put in working order by Marconi operators and engineers. Results were obtained which met with the entire satisfaction of the Siamese Government. The work was in charge of Mr. Cantoni, one of the engineers of the Rome agency, and what follows are some impressions of the country which occurred to Mr. Cantoni whilst the work was in progress. We present the account in the picturesque style in which it was written, and which, perhaps, can convey better than any other account the peculiar difficulties under which the work was carried out.]

ABOUT the end of the rainy season, in October, 1910, one of the 100 km. Marconi field stations was erected in the "Promenade Ground," a large, oval manœuvering place before the walls of the "White City." The three masts, set in a line from north to south, and the thin net of wires and stays of the aerial, showed off against the distant golden obelisks, the beautiful pagodas, and the Royal Palace with its shining roofs. The earths are spread one across the other on the grass, and the long cable which unfolds among the green like a thin, black snake, connects the apparatus with the cart containing the motor generator. The motor throbs regularly and rapidly; a little blue cloud of smoke is emitted from the silent chamber at every new vibration; the switchboard lamps burn with a reddish, almost mysterious light. Some soldiers lie on the grass, singing their national songs; others inspect the working of the apparatus and discuss in their way the mysteries of wireless telegraphy. The spark is very good; the motor runs well; all is in order, and we shall thus be able to erect the other station on the following day.

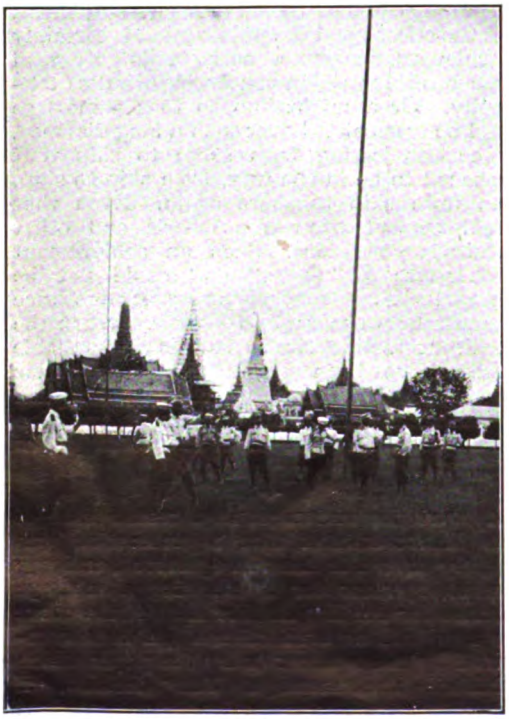

Fig. 1.—Installing a 100 km. Station at Bangkok.

. . . . .

It is 5 a.m. The Menam River (the great mother of waters) runs quietly between its green banks. Large Chinese junks and small Siamese "sanpans" slowly glide along the waters. On the banks, amidst the palms and the secular tamarind trees, rise the white pagodas. Hawks, crows, and vultures darken the clear sky. The boats which are to convey the wireless material and the soldiers in charge of the stations are ready to proceed on their way.

"All in order?"

"Ko-rap" ("Yes, sir"), is the answer.

The steam launch, on leaving the military pier, gives a warning whistle and the ropes of the tug are stretched, the boats moving slowly against the current. Passing the barracks of the "Transport Department" are to be seen soldiers scattered along the banks, who salute their comrades in the boats. Bangkok slowly disappears in a sea of green; the shining ribbon of the river narrows, then gradually vanishes in soft curves in the distance.

The cases and bundles have just been put in order. Water-bottles, saucepans, frying-pans, plates, forks, etc., are stacked in a corner, and near by the "boy" is boiling water for tea. Two soldiers in primitive costumes lie dozing on mats on the stern of my boat. I wake them up, and allow my boat to approach the one in

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front on which is the officer in charge of the station, who is busy arranging his provisions.

"We shall have tea later," I inform him; "meanwhile let us see that all is in order."

We pass on to the boat ahead of us, the two carts being well secured and covered by waterproof blankets. On the river everything is still; the sun is high; on both sides large fields of rice spread away out of sight.

Our progress continues slow and even for long weary hours, the monotony being momentarily broken by huts, villages, and pagodas which we pass on our way.

. . . . .

Out of the evening twilight a distant light shines at the top of a white tower; it is the lighthouse of Ban-pa-Jin. In the reddish evening dusk appear clearly the white walls of the Royal summer palace. We halt for a few minutes, consult our maps, and make purchases from the natives who have approached us in their sanpans with sugar reeds, bananas, rice tarts, and other specialties of the place. We continue then our journey; at 9 p.m. we are at Ayuthia. This is the old capital of Siam, a town of cyclopean ruins, the principal part of which are situated on a large hilly island, where once rose the walls, the temples, and the palaces of the ancient Siamese dynasties. We moor our boats just below the soldiers' barracks. In the yellowish light of the few lamps scattered here and there we see the trunks of the high palm trees rising along the banks. Before us is the mass of an immense floating house finely outlined, and which is destined to lodge princes and military authorities. A large verandah which is paced to and fro by a sentry runs all around the building, and from an open blind we see a large drawing room illuminated by a myriad of electric lamps fed by the dynamo of the barracks.

I land with the engineering officer, and together we visit the commander of the place, in order to inform him of our arrival and to obtain information from him as to the most convenient spot on which to erect our station. I am received with great politeness, and our conversation turns to wireless telegraphy—the wonders of which interest the commander very much. While talking we are sipping tea in small cups of Siamese porcelain. After some time I take leave and withdraw to the floating house, which has been kindly put at my disposal during my stay at Ayuthia.

At the river banks early on the following morning the soldiers are taking their first ablutions of the day. The boat, on which is the station, is drawn as near as possible to the banks, and is securely fastened by means of ropes to the palm trees. We first disembark benzine and oil, then we pile up the remaining firewood, which was scattered at the bottom of the boat against her sides, thus making a gangway for landing the carts. The soldiers at our disposal numbered only thirty, which was insufficient for our purpose, but we had no difficulty in obtaining a larger number.

"Cheer up, men. Some to the wheels, some to the shafts, some to the ropes." Everybody is pulling, and the cart slowly moves along the creaking planks. "Sallapa." Sal..la...Paaaa (hoist, hoist.) One last effort, the cart has left the planks; it is on land, still dragged on by our men up a slope, leaving deep ruts in the ground

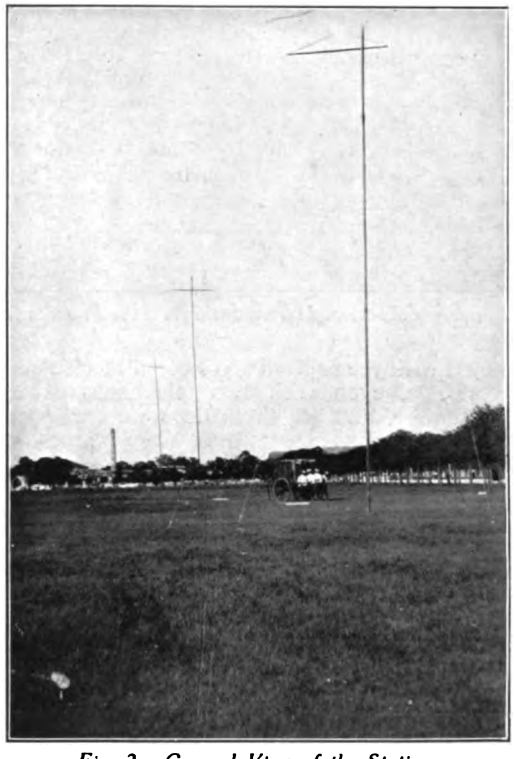

Fig. 2.—General View of the Station.

till at last it is safe on the plain. Our objective was a large manœuvering ground, a well-kept meadow enclosed on three sides by barracks and thick green vegetation, while the fourth side was sheltered by a well-grown palm plantation, in the midst of which, on a little hill, appears the beautifully-shaped dome and the obelisk of a very old pagoda. The ground is very good for our purpose, and we could not hope for anything better at 72 km. north of Bangkok.

The station was put up on that day, and on the following morning we exchanged the first

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Fig. 3.—First messages transmitted from the Promenade Ground.

signal with the capital. We could receive very distinctly, even with two telephones at the same time, and for three days we exchanged communications constantly. Then we received the order to proceed farther north along the banks of the Mesack, a tributary of the Menam.

At sunrise the next morning we left Ayuthia, and steamed down the river until we reached the point where the two bran hes of the Menam, after encircling the island, meet again, forming at that point a great expanse of water similar to a large lake. On the left bank, crowded with houses, the great overtowering Wat, wherein is worshipped one of the largest statues of Buddha existing in Siam; on the right of this shrine can be seen a bridge connecting the railway between Bangkok and northwards towards the Chinese frontier.

We pass before the pier of the royal palace at Ayuthia, and then arrive in view of a picturesque island, where one of the king's brothers resides. The Mesack is treacherous at the point where it joins the Menam, and one of our boats was upset in a whirlpool, the occupants having narrow escapes. The banks of the Mesack are very high, but the ground on both sides is marshy and covered with rich vegetation.

Ta-Rua was reached in the afternoon. This village is touched by the Bangkok-Korat railway, which at this point crosses the river on an iron bridge, constructed by German engineers in 1886. Another small station of a branch railway between Ta-Rua to Pra Bat (the first mountain to be seen on the way from Bangkok to the north-east) lies a little further away. This makes a very fine excursion, something like a trip in Switzerland. On the Pra Bat are to be seen the footprints of Buddha.

In company with the Siamese officer I went for a trip up the river in search of a convenient place where to erect our station. My companion favours the village of Ha Phya Tot Dicca. "There is very little to choose," I say, "let it be Ha Phya Tot Dicca."

We return to Ta-Rua, and with our four boats go up the river again, while the sun sets in a sea of fire. The syren of our tug begins to whistle; we have reached Ha Phya Tot Dicca, but owing to the lateness of the hour there is nothing for us to do but to wait till morning of the next day for our work. The day has been hot and sultry; we are very weary, and fall asleep under our mosquito nets.

"How shall we get our carts across so much mud?" was my first thought at the dawn of the next day.

"Nai Ott," I said to the officer, "we shall have great difficulty in landing the station;" we therefore decided to leave the generator cart on board and carry the parts ashore. The firewood scattered across the bottom of the boat was again heaped against the sides; the hollow dividing the boat from the bank was filled up with trunks of trees, and by means of planks we made a road leading from the landing to the top of the hill, where after many

Fig. 4.—Siamese Officers and Soldiers working the Stations.

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efforts we succeeded in carrying our cart. It was a great event for the inhabitants of the village.

" Tu ra leck mai mi sai " (wireless telegraphy) they shouted to each other ; " tu ra leck mai mi sai," but they did not know the full meaning of their words.

At sunset the first waves were propagated from our aerial ; for the first time the sound of the spark echoed in that distant land, and the genius of Marconi had gained a further victory. In the boat below the motor throbbed with rhythmical noises ; at the top of the hill the vivid light of the spark broke the first shades of the night.

At the dawn of the following day we established communications with Bangkok over a distance of 95 km. We remained at Ha Phya Tot Dicca for some days, but were obliged to hasten our departure on account of the rising of the river, caused by the heavy rains which had fallen in the east. Indeed, some of our pickets were already standing in water, and the masts and stays began to be submerged in an alarming way. Standing waist deep in water we rapidly lowered the masts, and swam about in order to recover the anchorage. Happily we succeeded in recovering all the material without mishap.

We left Ha Phya Tot Dicca on the following morning, proceeding along the river in a north-easterly direction, and reaching Sara Buri in the afternoon. This is a place of some importance on the railway line of Korat at 113 km. in a straight line from Bangkok. There is a governor, police, good roads, well-built houses, and some Indian and Chinese shops. About 2 km. down stream on the left bank of the Mesack are the barracks of the artillery, with a garrison of about 400 soldiers and several field batteries. From east to west, a little distance from the village, stretch the first chains of mountains, covered with thick and impenetrable forests. Near the village the river becomes impassable for our boats. Shallows and reefs emerge upon the surface of the water, and render the passage even of native flat boats difficult. The water here runs deep between the banks, which rise upward of 15 metres from the water line. Commencing at the barracks a large road leads to the river ; it had been constructed about fifteen months before our arrival in order to facilitate the landing and transportation of the artillery material. Unhappily this road, made by hundreds of Chinese coolies, had been partially spoiled. The two sides of the road had been neither protected by masonry nor by any other means, and the road itself had been left as it had been dug, without a stone being laid on it, so that the floods had caused great land-slides, and the waters coming down from the surrounding heights had found in the road an excellent outlet.

In spite of all, this was a fair means of

Fig. 5.—At Ayuthia. Receiving messages from Bangkok.

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Fig. 6.—Disembarking under difficulties at Sara Buri.

transporting our carts. The commander placed a number of soldiers at our disposal, as well as the material necessary for the landing of the stations. On the following morning the boat carrying the station was pushed as far as possible into the mud, and was secured to the land by ropes. More than two hundred soldiers were required to carry our carts from the river to the top of the hill. Reeling, bouncing up a muddy slope, the cart advanced by slow stages, dragged on by those men half naked and bespattered with mud from head to foot, and shouting "Sallapa" (Sal-la-pa). At sunset all the material had been carried to the upland, where we had to erect the station. On the following morning we put up the masts in a large rice field, wading in the mud up to our knees.

For a whole week we communicated with Bangkok, exchanging several service telegrams and messages of greetings to many princes. Then we received the order to return to Bangkok. The embarking of the material was still more difficult than the landing owing to the muddiness which stuck to the wheels; one of the carts slipped out of the wooden rails we had made and fell into a pool; we had to work for two days and two nights by the light of the torches to recover it.

. . . .

From the high banks the artillery soldiers shouted their farewell to us, and the boats floated rapidly down the river. In a few moments we lost sight of our former companions, and could hear faintly in the distance the songs of the soldiers, the hoarse whistle of the bamboo flutes and the deep rumble of odd drums, which play such an important part in Eastern music.

Fig. 8.—A 25 km. Station Operated at Dong Muan during the Manœuvres.

Fig. 7.—Transporting a Station up the Menam.

The British Consul at Naples reports that during December, 1910, the wireless telegraph station erected on the heights above Naples by the Marconi Company was made available to the public in connection with the ordinary telegraph system. Naples is now in communication with Palermo and Cagliari. The Naples station has been given the name of Castel S. Elmo, and its signal is M.N.S.; Palermo is M.P.P., and is called Sferracavallo; whilst Cagliari, called Castiadas, has the letters M.P.O. as its signal.

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Wireless Facilities for Liverpool

AN arrangement of considerable importance has been made by the Marconi International Marine Communication Co. with the Postmaster-General, whereby ships lying in the Mersey will be allowed to communicate with ships lying in the Liverpool docks or river, provided that such communications are strictly on service matters, and that the messages are transmitted strictly in accordance with the following regulations :

1. That the communicating ships are inside the line joining Seaforth Barracks and the New Brighton Tower.

2. That the messages transmitted between the officers of the ships and the company's representative relate only to the affairs of the ships.

3. That communications shall cease immediately on receipt of the signal "S.T.P." from Seaforth wireless station, and shall not be recommenced without permission from the Seaforth wireless station, which will be communicated by the signal "Cancel S.T.P."

4. That if at any time it is desired to pass a message between ships in the river as defined in paragraph 1, and another ship outside this limit, the message must be passed through Seaforth wireless station as an ordinary radio-telegram.

5. Operators must take every precaution not to interfere with the legitimate business of the Seaforth wireless station.

It would appear that prior to this arrangement being arrived at no messages might be sent from a ship in the river to a ship in the dock, although belonging to the same line. All messages were supposed to pass through the hands of the postal telegraph authorities, which, not only might mean delay, but expense. The Postmaster-General has now made the concession that direct communication may be made from ships in the river to ships in dock, always providing both ships are inside a line from New Brighton Tower to Seaforth Barracks.

There is, however, a restriction placed on this concession, as the above regulations show, for any messages sent in this form must be exclusively messages transmitted from the officers in charge of the ship to the company's representative, and having reference only to business in connection with the ship. All messages between ships in the river and those outside the specified line must pass through the Seaforth wireless station, to which reference was made in the October number of THE MARCONIGRAPH, and will be dealt with by the postal authorities as an ordinary marconigram. There is no doubt that this arrangement will be greatly appreciated by the large shipping companies whose vessels may have to lay sometimes in the river, as it is almost equivalent to connecting them by telephone.

Wireless and Aeronautics.

In a letter to *The Times*, Mr. L. Blin Desbleds (lecturer in Aeronautical Engineering at the Polytechnic, Regent Street, London, W.) enters a strong plea in favour of having at one or more of our principal universities and colleges complete courses in aeronautics and the subjects relating thereto. Such a course, Mr. Desbleds suggests, should comprise (*a*) Summary of the world's most important aeronautical researches, methods and results ; (*b*) methods of dealing with aeronautical problems ; (*c*) the strength and elasticity of materials used in air-craft construction, comprising calculations of the chassis, fuselage, wing-framework, etc. ; (*d*) all available experimental data concerning aerial propellers ; (*e*) the petrol motor, with special reference to light motors for aerial work ; (*f*) the testing of petrol motors ; (*g*) the design of aeroplanes ; (*h*) meteorology ; (*i*) wireless telegraphy ; (*j*) aerial map-drawing and map-reading. We are glad to see that wireless telegraphy is included in the above scheme, for obviously the aeroplane would lose half its value from the military standpoint if this subject were neglected.

A Veteran's Travels.

Lord Strathcona, the High Commissioner for Canada in London, who is over ninety years of age, left England for Canada on September 23rd on the "Mauretania." He arrived in England on October 10th on board the same vessel, and took train immediately for London, reaching the metropolis about mid-day. His lordship then proceeded direct to Scotland, where Lady Strathcona is in residence. During the interval Mr. Griffith, the official secretary in London to the Canadian Government, has been in frequent communication with Lord Strathcona by means of wireless telegraphy. Thus in seventeen days Lord Strathcona covered 10,000 miles—a record which many a younger man would be proud of. When the "Mauretania" was at sea Lord Strathcona sent the following message to the *Daily Mirror* by wireless telegraphy, via Rosslare, Ireland :

> Landing at Fishguard at three to-day. Everything most comfortable in this fine steamer, which is making a passage of five days, as against that of forty-two days made by sailing vessels, the only means available, forty-seven years ago. I am most hopeful that, as a fitting inauguration of the new Viceroyalty, we shall have within two years equally speedy steamers running direct to Canada, bringing London within four and a half days of Montreal and Ottawa and within eight days of the Pacific coast. Since the above was written it has been announced that it is impossible to proceed to Fishguard owing to the stormy weather. We will land Liverpool, eight, Tuesday morning.

Surely the means employed for transmitting the above message are as notable as the great achievement to which the message refers.

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Australasian News

(From Our Correspondent)

Sydney, N.S.W., *August 29th.*

THE installation of one of the 1½-kw. Marconi ship sets was completed on board the s.s. "Karoola" on June 17th last, and a similar installation has just been completed on the s.s. "Koombana." The "Karoola" is the largest ship at present engaged in the Australian inter-State trade. She is a fine twin-screw steamer of 7,391 tons gross, and has accommodation for first, second, and third class passengers equal in every respect to that of a transatlantic liner. She has spacious decks, deck cabins, *cabins-de-luxe*, and a gymnasium. The "Karoola" was built in 1909 by Messrs. Harland & Woolf, at Belfast, to the order of Messrs. McIlwraith, McEacharn & Co., Ltd., of Melbourne, and, since her arrival in Australia in September, 1909, has been employed by Messrs. McIlwraith, McEacharn & Co. for their inter-State trade between Sydney, Melbourne, Adelaide, Albany, and Fremantle.

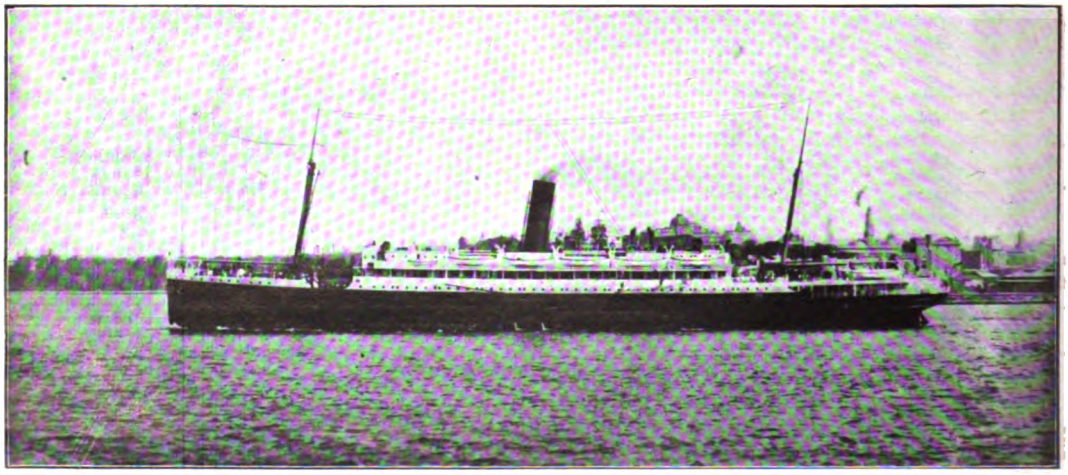
The wireless installation on board has achieved splendid results, and great use is made of it by the captain and passengers. Communication with other ships equipped with Marconi apparatus is frequently obtained over distances ranging from one to two thousand miles, and on two recent occasions the "Karoola" has succeeded in establishing communication and exchanging messages with the Marconi station at Cocos Island, from Cape Naturaliste on the West Australian coast, a distance direct of 2,250 miles, thus establishing the record long-distance communication for ships on the Australian coast.

The s.s. "Koombana," owned by the Adelaide Steamship Company, has been in Sydney undergoing her annual overhaul, and at the same time has been equipped with a Marconi installation. She left Sydney on August 28th for Melbourne and Fremantle. The "Koombana" carries on a Royal Mail and passenger service between Fremantle and ports on the north-western coast of Australia, going as far north as Port Darwin and Wyndham. The "Koombana's" gross tonnage is 4,200. This is the second ship on which Marconi apparatus has been installed for the Adelaide Steamship Co.

The installation on board s.s. "Grantala" has given splendid results; communications over distances ranging from one to two thousand miles are frequently obtained. The ships of the P. & O., Orient, Blue Funnel, White Star, and Aberdeen lines, arriving here from England equipped with the Marconi system, all report having maintained communications over very long distances.

The Orient liner "Osterley," which arrived at Sydney on August 17th, had wireless communications every day during the voyage from London to Sydney. Among the passengers from London by the "Osterley" were the Hon. Andrew Fisher, Federal Prime Minister, returning from the Coronation and Imperial Conference, and Madame Melba, the famous *prima donna*. These celebrities and their fellow-passengers made great use of the Marconi installation during the voyage.

The necessity for the adoption of Marconi telegraphy on all passenger ships has been brought forcibly before the Australian people by the loss of the s.s. "Fifeshire," near Cape Guardafui, while on a voyage from Sydney to



The S.S. "Karoola"

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London. One of the "Fifeshire's" lifeboats, with a number of passengers and members of the crew on board, is still missing, and their fate remains unknown, while the crew of another lifeboat suffered terrible privations before they were rescued. Had the "Fifeshire" been equipped with Marconi apparatus, she would have been able to communicate with one of the numerous ships passing that way which carry Marconi installations, and would have obtained immediate assistance.

According to the *Telegraph and Telephone Age* the Postmaster-General of Australia has issued regulations in which provision is made for the issue of general licences at 5s. each for ships registered in Australia and for experimental licences at £1 1s. each. The appliances on board ship are to be worked in such a way as not to interrupt or interfere with the naval or military signalling or the transmission of messages between other wireless telegraph stations. Except by permission of the Postmaster-General, the wireless aboard any ship (other than a ship of war) is not to be worked while the ship is in any harbour or any territory of the Commonwealth. Power is given to the Governor-General to prohibit the use of wireless telegraphy on board foreign ships in territorial waters in case of emergency.

Welcome by Wireless for the Duke of Connaught

THE arrival of the Duke of Connaught in Canada to undertake the office of Governor-General was awaited in the Dominion with great interest. Shortly after the departure of His Royal Highness from this country, Earl Grey, the late Governor-General, sailed from Canada. The journey was notable for two incidents: first, that the final arrangements for the reception of the Duke were made by wireless; and second, the wireless communications that passed between the Duke of Connaught and Earl Grey on the high seas, an incident which is said to mark a departure from precedent. The Duke and Duchess of Connaught sailed on the "Empress of Ireland," which carried a Marconi wireless equipment. In the ordinary way he would have been entirely out of touch with his friends and well-wishers in both continents, and the Canadian public would have been without news of their new Governor-General until his arrival. Thanks, however, to the use of wireless, the Royal party were never entirely cut off from land, and towards the end of the voyage some interesting communications were sent from the "Empress of Ireland," of which the Montreal correspondent of the *Daily Telegraph* has succeeded in obtaining the text. One message intimated that the Duke of Connaught was making a pleasant voyage. It was sent from the ss. "Empress of Ireland" (viâ Point Riche and Cape Ray, Newfoundland), October 11th, and ran as follows:

Glorious weather greeted the arrival of the Duke of Connaught in Canadian waters this morning. The misty drizzle of last night had cleared away, and to-day broke fine but cold. We entered the Straits of Belle Isle in the early hours of the morning, but the Duke was on deck at seven a.m., admiring the coast scenery through the latter part of the Straits.

The next message received from the "Empress of Ireland" contained some interesting and historic news, and at the same time it showed that the Duke of Connaught was making plentiful use of the wireless apparatus. It ran:

Their Royal Highnesses are receiving messages of welcome from every passing station and every passing vessel. Among them was a greeting from Earl Grey stating that the new Ministry had been sworn in, and welcoming his Royal Highness to Canada. The Duke has already "Marconied" about twenty replies. Through the courtesy of his Royal Highness, the names of the members of the new Cabinet were published on board, the news arousing the keenest interest. The general feeling among prominent Canadians on board the "Empress of Ireland" seems to be one of satisfaction at Mr. Borden's selection. The Duke and Duchess are evidently both greatly pleased at the greetings they have received. The Duchess is making a tour of the ship this afternoon, visiting all the classes on board. The Duke has already made a similar tour, and met with a most cordial reception everywhere.

The "Empress of Ireland" is assuming a festive air, gay decorations of bunting, bannerettes, flags, flowers, and drapings appearing everywhere. Everybody on board seems infected with the general gaiety, and none more so than the Royal passengers.

Next we come across a long message sent viâ Cape Ray, Newfoundland, on October 11th:

After a few hours of splendid weather approaching the Straits of Belle Isle keen winds began to blow, bringing in their train a heavy drizzle and wet mists, while the sea became choppy. Their Royal Highnesses, however, persisted in promenading the deck together, afterwards taking tea in the cage. The Duke subsequently remained on deck chatting with various passengers, who, following his example, stayed to walk until dinner-time.

In deference to his Royal Highness's expressed desire, there is a continuance of the absolute lack of formality which marked his first appearance on board. He mixes freely with the passengers every day, and enjoys nothing more than a chat about Canada or something Canadian. As we approach our journey's end the Duke's enthusiasm and keenness to be at work in the Dominion become increasingly apparent. So far the trip has been singularly uneventful—one wholly devoid of any untoward incident.

Owing to general inclement weather, even the usual sports on deck have not been organised. Both the Duke and the Duchess, however, have apparently benefited by their few days at sea. The Duke's activity in promenading decks is surprising everybody on board. The officers declare it would be creditable even in a much younger man. His Royal Highness easily outwalks the members of his staff. Indeed, he is hardly below at all during the daytime, except when driven down by the heavy seas which have from time to time broken over the vessel and made many of the passengers most unhappy.

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Maritime Wireless Telegraphy

Since our last number the Marconi International Marine Communication Co., Ltd., has fitted the following ships with its 1½-k.w. and emergency plant: s.s. "Galway Castle" and "Guildford Castle" for the Union Castle Line, s.s. "Elysia" for the Anchor Line, s.s. "Plassy" for the Peninsular & Oriental Co., s.s. "Tahiti" for the Union Steamship Company of New Zealand, s.s. "Rohilla" for the British India Steam Navigation Co., s.s. "Manco" and "Aidan" for the Booth Steamship Co., s.s. "Rawson" for the Argentine Navigation Co., and s.s. "Zealandic" for the White Star Line.

The private steam yacht "Iolanda" and the Peninsular & Oriental Co.'s s.s. "Ballarat" are now being equipped with Marconi apparatus.

The Marconi International Marine Communication Co., Ltd., has also received instructions to equip the following vessels: s.s. "Montoro" for Messrs. Burns, Philp & Co., and s.s. "Armenian" and "Victorian" for Messrs. Frederick Leyland & Co.

La Cie de Télégraphie sans Fil has received an order from Messrs. Fredriksen, of Staback, near Christiania, for the equipment of their whaling vessel, the s.s. "Falkland," with a 1½-k.w. set. This ship is intended to sail from Toensberg on November 1st for the Antarctic.

The above company has also received instructions to equip the "Absalon," of the Royal Danish Navy.

La Cie Francaise Maritime et Coloniale de Télégraphie sans Fil have received instructions from the Compagnie Générale Transatlantique to equip the s.s. "Timgad."

S.S. "Tahiti" of the Union Steamship Co. of New Zealand.

International Radio-Telegraphic Conference in London

The Bureau International de l'Union Telegraphique notifies that the next Radio-telegraphic Conference will meet in London on June 4th, 1912, and that the latest date for the submission of proposals to the Conference is postponed until December 1st next. It is proposed to grant the right to vote at this Conference to each of the following British Possessions—namely, the Australian Commonwealth, Canada, British India, New Zealand, and the Union of South Africa.

✦

Intimation has been received from the Bureau International de L'Union Télégraphique (Convention Radiotélégraphique Internationale) at Berne, that the following call letters have been reserved for vessels which are about to be equipped with Marconi apparatus, irrespective of the countries in which these vessels are owned:

MFM, MFR, MGQ, MGZ, MIO, MIV, MIY, MJR, MJW, MJY, MJZ, MKT, MKU, MKV, MKW, MTB, MTG, MTT, MTV, MTW, MTY, MTZ, MUK, MUM, MUQ, MUT, MUV, MUY, MUZ, MVJ, MVV, MVW, MVY, MWB, MWD, MWG, MWH, MWK, MWM, MWP, MWQ, MWY, MWZ, MYA, MYB, MYE, MYF, MYI, MYJ, MYK, MYP, MYQ, MYR, MYW, MYY, MZE, MZF, MZG, MZH, MZO, MZP, MZQ, MZZ.

✦

The annual report of *Lloyd's Register of Shipping* issued last month shows that no fewer than 1,013 vessels are now fitted with wireless telegraphic installations.

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At a fancy dress ball held on board the R.M.S. "Asturias," Miss Betty Beresford, niece of Admiral Lord Charles Beresford, M.P., and Mrs. Bartlett, a daughter of Sir Philip Rose, were attired in Marconi uniforms, as shown in the accompanying illustration.

At a fancy dress ball, held recently at Odda, a lady went as "Wireless Telegraphy," and succeeded in carrying off the first prize for the most original lady's fancy dress.

Two wireless masts have recently been erected on the roof of the building known as G.P.O. West, London. These masts, which are 50 feet high, and stand about 240 apart, support a system of bare copper wires forming the aerial of a wireless station in connection with the laboratory of the General Post Office Engineering Department. The main purpose of this installation is experimental.

The Bristol biplane No. 19 recently carried out some wireless experiments at Hayling Island for the Government.

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Diary of Events.

[*Under this heading we give a monthly record of the progress of Marconi wireless telegraphy. Apart from the general and historical interest which attaches to such a compilation, we have reason to believe, from the number of inquiries that constantly reach us, that it will be of much service to lecturers, tutors and others who may be professionally interested in the subject. Appended are some notable events that have occurred in November of preceding years.*]

1897.

November.—The first Marconi station was erected at The Needles, Alum Bay, Isle of Wight. Experiments were conducted between that station and Madeira House, South Cliff, Bournemouth, where Mr. Marconi was residing at the time, a distance of 14½ miles.

1900.

November.—The Belgian Royal Mail Steam Packet "Princess Clementine," plying between Ostend and Dover, was fitted, and a Marconi wireless telegraph station installed at La Panne, on the Belgian coast, near Ostend.

The Marconi system was adopted by the Metropolitan Fire Brigade, and apparatus fitted at Mitcham Lane station box and Streatham fire station.

1901.

November 2nd.—The Compagnie Generale Transatlantique s.s. "La Savoie" left Havre on first voyage fitted with Marconi apparatus.

November 7th.—An agreement was made with the Government of Newfoundland for the installation of wireless telegraph stations in Newfoundland and Labrador.

1902.

November 1st.—The Marconi Wireless Telegraph Company of Canada was incorporated.

Personal

Mr. Jack Irwin, the operator selected by Mr. Melvin Vaniman to take charge of the wireless apparatus on the airship "Akron" in the attempt to reach Europe, has had an interesting and adventurous career. In 1900–1902 he served in the Boer war as a soldier, and also military telegraphist and signaller, receiving decorations from both Queen Victoria and King Edward for his services. In 1906 he served on the headquarters staff of the Commander-in-Chief in the Zulu campaign of that year, as a signaller and operator, and was again decorated for his services. Returning to America, he joined the staff of the Marconi Company. In 1910 he accompanied Vaniman and Wellman in the airship "America" in their vain attempt to cross the Atlantic, and did excellent work with the wireless and signal lamp when the crew were in distress. He is the only wireless operator who has the unique record of both sending and receiving the "CQD" signal, a distinction which has earned for him the name of "CQD" Jack Irwin.

The Honourable Mrs. Marconi has been appointed a Lady-in-Waiting to the Queen of Italy. This is another mark of the high regard the King of Italy has for Chevalier Marconi.

Operators in London

THE keen interest which is taken in THE MARCONIGRAPH by the large and increasing army of operators both on land and afloat is well manifested by the numerous communications of goodwill that reach us from engineers and operators. As one of our correspondents put it in a letter:

"Owing to the manner in which operators are at present transferred from ship to ship, now being sent on a voyage to Australia, then to America, and afterwards, say, to South Africa, it has hitherto been practically impossible for an operator to follow the movements of his colleagues, or even the brilliant achievements recorded under the ægis of the Marconi Company in the wireless world."

Another correspondent accompanies his praises of this journal with a suggestion to which we are pleased to give publicity. He points out that hundreds of operators whose homes are in the provinces have occasionally to spend some time in London without having any central place (apart from the Marconi Company's offices) where they can meet their colleagues or extend their acquaintance among operators. Moreover, many a man, he thinks, would like to spend his nights in London in the same house or hotel as other operators, instead of having to make shift on his own. What he suggests, therefore, is that arrangements should be made by a committee of operators at some hotel in the neighbourhood of the Marconi offices, where those who have to pay a brief visit to London will be accommodated and which they can make a common meeting ground for social intercourse and recreation in their leisure hours. The suggestion is one which we can heartily commend. We should be pleased to render what assistance we can in bringing a scheme on the lines suggested to a successful issue. But before doing so we should like to hear from others interested in the matter, and if a sufficient response is forthcoming steps will be taken to convene a meeting of operators, and to formulate plans for consideration from the suggestions which we receive in the meantime. Obviously the idea is one which is capable of

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wide and beneficial application, for, in addition to the recommending of a suitable place or places at which to stay, such a centre or club—call it what you will—can afford excellent opportunities for the passing of the long winter evenings by those who are only temporarily resident in London in pleasant conversation, or perhaps occasionally social gatherings. And why should there not sometimes be set apart an evening when wireless operators can meet, without convention, to recount experiences and adventures which have occurred in the course of their careers? Communications bearing on this subject should be addressed to the Editor of THE MARCONIGRAPH, Watergate House, York Buildings, Adelphi, London, W.C.

Movements of Telegraphists

The following transfers have taken place during the past month:

Mr. C. H. Sharpe, from the "Sarnia" to the "Caledonia."

Mr. E. W. Sharpe, from the "Caesarea" to the "Rohilla."

Mr. F. V. Kinder, from the "Minneapolis" to the "Gothic."

Mr. J. Murphy, from the "Laurentic" to the "Minneapolis."

Mr. C. J. Chandler, from the "Omrah" to the "Cameronia."

Mr. R. Harding, from the "Montezuma" to the "Ascania."

Mr. H. J. James, from the "Carmania" to the "British Sun."

Mr. A. W. Wyett, from the "Antony" to the "Himalaya."

Mr. W. H. Silvester, from the "Haverford" to the "Inanda."

Mr. W. M. Sweeney, from Clifden to the "Mantua."

Mr. O. Jones, from the "Otranto" to the "Moldavia."

Mr. W. Crabb, from the "Inanda" to the "Montrose."

Mr. A. J. Reynolds, from the "Galician" to the "Morea."

Mr. C. A. Weller, from the "Ruahine" to the "Otranto."

Mr. L. T. Sanderson, from the "Ausonia" to the "Ruahine."

Mr. A. J. Chesterfield, from the "Galway Castle" to the "Guildford Castle."

Mr. A. D. Giles, from the "Campania" to the "Celtic."

Mr. R. Atkinson, from the "Baltic" to the "Antillian."

Mr. H. Hayes, from the "Empress of Ireland" to the "Corsican."

Mr. W. Groves, from the "Oropesa" to the "Plassy."

Mr. T. Knox, from the School to the "Teutonic."

Mr. C. Matheu, from the "Lusitania" to the "Oropesa."

Mr. C. Peters, from the "Cymric" to the "Ivernia."

Mr. F. White, from the "Ambrose" to the "Antony."

Mr. P. B. Maltby, from the "Canadian" to the "Elysia."

Mr. S. H. Abbott, from the "Teutonic" to the "Vandyck."

Mr. W. H. Knapman, from the "Arabic" to the "Merion."

Mr. H. K. Gibsone, from the "Merion" to the "Hubert."

Mr. W. Banbery, from the School to the "Arabic."

Mr. C. F. Evans, from the School to the "Cedric."

Mr. J. Craigie, from the School to the "Afric."

Mr. F. A. Bradley, from the "Adriatic" to the "Canadian."

Mr. F. Collier, from the School to the "Adriatic."

Mr. T. Evans, from the "Caronia" to the "Lake Champlain."

Mr. R. Lee, from the "Virginian" to the "Celtic."

Mr. W. Craven, from the School to the "Virginian."

Movements of Engineers

Mr. R. H. White has left Clifden to take up duties on the Field Station Staff.

Mr. H. J. Round has returned from Glace Bay, and is now doing special experimental work at Chelmsford.

Mr. C. E. Prince has returned to Chelmsford from Athens.

Mr. E. J. Watts, having successfully completed his work at Capetown, sailed for England on October 18th.

Mr. S. R. Groser sailed for India on October 14th.

Mr. H. Dobell has returned to Spain, where he is temporarily in charge of the Spanish contract in place of Mr. R. N. Vyvyan who has returned to London on sick leave.

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THE MARCONIGRAPH

No. 9. December, 1911. Subscription, 3/- per annum, post free. Price 2d. Post Free 3d.

Wireless in Chili

THE Chilian Government have entered into a contract with Marconi's Wireless Telegraph Co., Ltd., for the erection of two large and two smaller stations in Chili. The first two will be situated at Punta Arenas and Talcahuano. The installations are designed to afford regular communication at all times during the day or night between these towns, taking into account the existence of severe atmospheres in that region at certain times, and also the presence of very high mountainous country between the two stations. The transmitting plant is arranged to tune normally to a wave length of 16,000 ft. for communication over the maximum distance, but provision is also made for transmission on a wave length of 8,000 ft. when desired for other communication.

The mast system is designed for the safe support of a multiple wire aerial of the directional type. The masts are nine in number, seven of which are of the sectional steel type with wooden top-masts, 250 ft. in height, and the remaining two are single-spar wooden masts 50 ft. in height. The earth system consists of a circle of galvanised plates buried in a symmetrical position relative to the power house, and connected to it by a system of radial conducting wires leading to the house approximately at the centre of the circle. The arrangement is capable of an extension in the form of a number of copper wires connected to the above-mentioned earth circle, but carried out in the same direction as and parallel to the earth wires and buried in the ground below, thus forming a rough reproduction of the form of the suspended aerial system in the ground beneath. The generating plant at the Punta Arenas and Talcahuano stations will comprise a direct current generator driven direct-coupled with an oil engine to charge an accumulator battery or to feed the motor alternator set direct. The combination of the plant in conjunction with the accumulator battery affords great flexibility of running, and has been found in practice to be adapted to meet the varying needs of wireless telegraph working in the most convenient manner. The accumulator battery will comprise 240 cells in lead-lined wooden boxes, having a capacity of approximately 864 ampère hours at the three hour rate of discharge. The switchboard calls for no special notice. Four single-phase oil-cooled transformers will be provided. The disc discharger is designed for producing a musical note in transmission, and consists of a steel disc with transverse copper studs rotating between adjustable revolving electrodes. The transmitting jigger is of the independent primary and secondary circuit type, having a multiple turn primary consisting of independently insulated copper laid up so as to provide for equal distribution of current throughout the section, and a multiple turn secondary of similar cable of smaller section. The secondary is to be adjustable laterally with respect to the primary for the purpose of varying the coupling between the circuits.

The aerial tuning inductance will consist of a solenoid winding of cable similar to that of the jigger secondary, having a total inductance sufficient for tuning the aerial to the various wave lengths required; the inductance to be provided with insulating plug sockets for connection to the jigger secondary and to the aerial respectively. Two receivers will be provided—one of these to have a range of adjustment between 15,000 and 30,000 ft. The receivers will be calibrated to permit the instruments to be set to any pre-arranged wave lengths.

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ANDREW A. ALLAN

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Andrew A. Allan

President of the Marconi Wireless Telegraph Co. of Canada, Ltd.

THE well-known, homely saying that a man may be known by the company he keeps may be applied to a great industry, of which the outside world may glean some knowledge from those who are prominently associated with it. In previous issues of this journal there have appeared sketches of men who have helped to develop the practical utility of the great invention which the world owes to the genius of Mr. Marconi. The feature which distinguishes the subjects of these brief sketches is the great knowledge of affairs common to all. Business acumen, shrewd foresight, and indomitable energy, developed in varying spheres of activity and in countries scattered over the face of the globe, are only some of the traits of those who are captaining the Marconi teams in their arduous battles to bring within reach of all classes the beneficent advantages of wireless telegraphy. Mr. A. A. Allan, who fills the niche in our gallery this month, is a worthy successor to the celebrities who have preceded him, and right worthily does he maintain the high traditions which are associated with those who are prominently identified with the Marconi interests.

Andrew Alexander Allan is well equipped both by parentage and by training for the position which he holds in the commercial world to-day. He was born on June 16th, 1860, at Montreal, Canada. His parents were of Scottish descent, and in the early training of their son they showed that love of education which is such a fine characteristic of their race. From Rugby, the youthful Allan returned to his native city for a course of study at the High School, Montreal, preparatory to being sent to France, where he was taken in hand by private tutors. We next find him entering upon a commercial career, commencing at the lowest rung. He joined the Allan line of steamships as an office boy in 1877, and there is a touch of the romance so dear to the heart of Samuel Smiles in the subsequent career of the young man, who worked his way up from that lowly position to that of manager of the great company whose destinies he still controls. The Allan Line have been the pioneers of Canadian shipping and navigation since the year 1882, and were the first regular mail carriers between Canada and the United Kingdom. Among other positions which Mr. Allan now occupies in the commercial world is that of president of the Shipping Federation of Canada, president of the Dominion Dry Dock Co., and director of the Merchants' Bank of Canada.

There is nothing more natural than that one so closely connected with shipping as is Mr. Allan should be interested in wireless telegraphy. The late Lord Salisbury, no less a philosopher than a statesman, once said: "We live in a small, bright oasis of knowledge, surrounded on all sides by a vast, unexplored region of impenetrable mystery, and from age to age the strenuous labour of successive generations wins a small strip from the desert, and pushes forward the boundary of knowledge." Mr. Allan was not slow to perceive what an important part wireless telegraphy would play as an aid to navigation through the waterways of Eastern Canada and around the Canadian coast, and it is no surprise, therefore, to find him taking part in the movement towards extending the boundaries of the great scientific discovery which Mr. Marconi wrested from Nature. Mr. Allan succeeded Colonel F. C. Henshaw as president of the Marconi Wireless Telegraph Company of Canada, Ltd., in November, 1907, and the success of the company, which is well exemplified in the report which appeared on page 19 of the November issue of THE MARCONIGRAPH, is in no small measure due to the great ability of Mr. Allan.

Although deeply absorbed in the various undertakings with which he is connected, Mr. Allan still finds a little time for club life, being a member of the following clubs: The Montreal Jockey, Montreal Hunt, Mount Royal, St. James's, and the Forest and Stream, all of Montreal; the Garrison Club, of Quebec, and the Rideau and Country Club, of Ottawa. Mr. Allan was married to Charlotte Elizabeth Torre on June 3rd, 1886.

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Wireless and Aeroplanes

Some Recent Experiments

THE feasibility of telegraphing by wireless from aeroplanes has already been amply demonstrated. Are we in this country preparing to reap the fullest practical benefit from this combination of two of the most remarkable developments in applied science that the past decade has witnessed? About four years ago the late Lord Kelvin, after attending a meeting of the British Association and listening to innumerable papers, declared his delight in having been "personally conducted on a magic tour through the universe, carried, not on aeroplanes that would not fly, but on the stronger and surer wings of scientific imagination." Were that great *savant* with us to-day he would no doubt see fit to modify his views with regard to aeroplanes, although he could scarcely have shown greater prescience than when he pinned his faith to "scientific imagination"—a phenomenon which has not alone given greater stability and reliability to the aeroplane, but which has brought us even farther by making it possible for the aviator in the course of his flight to communicate with those on the earth beneath him. The feat of Lieut. Conneau in encircling the United Kingdom in an aeroplane is still fresh in the memory of the public. But how many remember the gallant aviator's subsequent appeal (referred to at the time in this journal) to the French nation to take advantage of the possibility of employing wireless telegraphy in conjunction with aeroplanes? No response to this appeal is yet apparent in England; and without in any way disparaging the few experiments that have been made, there is reason for disappointment that experiments of this kind have not yet been conducted on a large, comprehensive scale, particularly from the standpoint of naval and military efficiency.

The development of the use of wireless telegraphy on aeroplanes involves a number of technical problems, the solution of which help to perfect the practice. In an article on the subject which appeared in the August issue of THE MARCONIGRAPH, the writer stated that in recent experiments carried out with Mr. McCurdy's aeroplane in the United States one long wire was used for an aerial antenna, the steel wires of the machine itself being used as counter-capacity. This article has brought us an interesting letter from Mr. Percy G. B. Morris, of Atlanta, U.S.A., who states that in the experiments referred to, the long "hanging antenna" was entirely dispensed with, and in its place several wires—aggregating in length about 150 ft.—were tightly stretched on the stern of the aeroplane, as shown in the accompanying illustrations. Fig. 1 relates to the Curtiss type biplane, and shows how the aerial

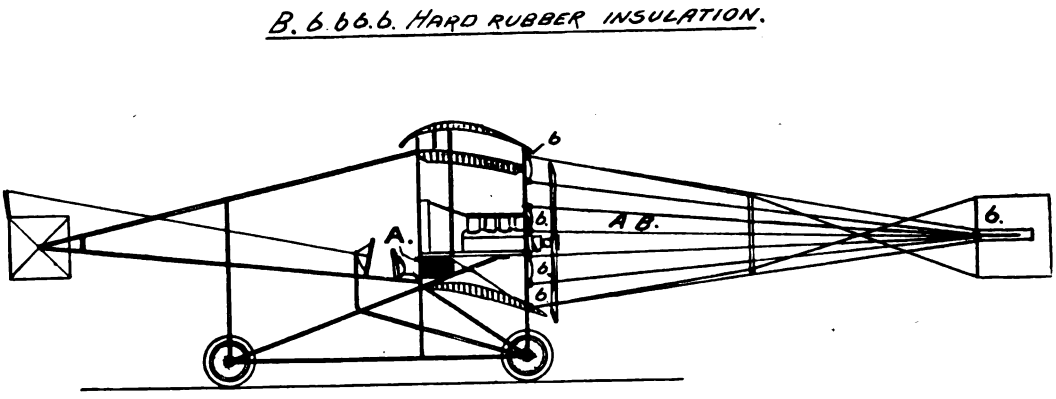

Fig. 1

antenna was disposed of, thus eliminating any possible danger from hanging antennæ, and utilising the metalwork and wire of the machine for counter-capacity. A is the Marconi wireless set placed on the bottom plane, A B being the antenna tightly stretched from the outside struts of the machine to the stern rudder; *b* is hard-rubber insulation. Mr. Morris informs us that the receiving experiments, which were conducted by himself, were highly successful, and that the instruments were carried in his lap. Fig. 2 presents a bird's-eye view of the Curtiss biplane equipped with Marconi wireless apparatus, showing the disposal of the aerial antenna; in this illustration A *a* represents the aerial antenna, and B *b b* hard-rubber insulation.

With regard to the opinion that "the idea of employing the network of wires on the aero-

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plane (as counter-capacity) is impracticable, as the wires become 'alive,' and might give serious shocks to the pilot or passenger," Mr. Morris declares that if a Marconi wireless set is installed in the manner referred to by

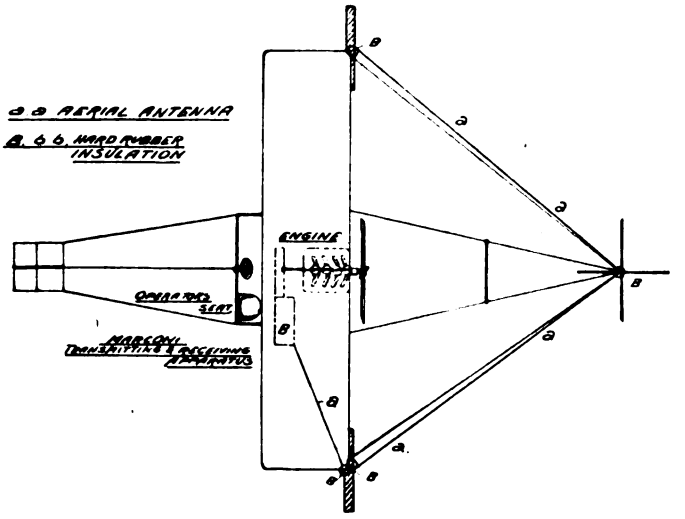


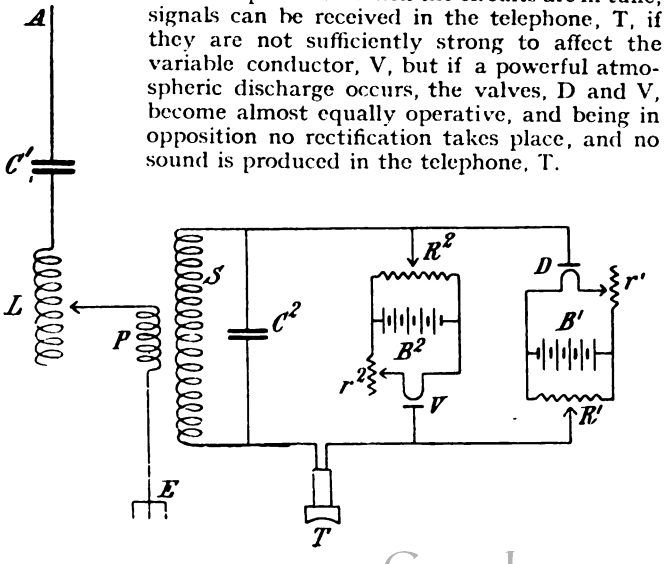
Fig. 2

him, using ordinary care in insulating both sides, the danger of shock to either pilot or passenger is minimised to a great degree, particularly in fine-weather work. In rainy weather it is possible that short circuits might at times occur between the counter-capacity employed (no matter of what type it might be) and the aerial circuit. As a result of exhaustive experiments, however, Mr. Morris claims to have obtained his best results and safest work with the "hook-up" described above.

Improvements in Receiving Apparatus

A PATENT in the names of Marconi's Wireless Telegraph Co., Ltd., and Mr. H. J. Round, and numbered 20441 of 1900, has recently been published. The specification describes means for reducing or eliminating the effects of atmospheric discharges on wireless telegraph receivers. For this purpose variable conductors are connected across a part of the receiving circuit in such a way that while they do not interfere with the receipt of signals, yet under the action of powerful atmospherics they become good conductors, and offer a shunt-path to the currents which would otherwise affect the detector. These variable conductors consist of practically any form of so-called valves, such as mercury vapour valves, Fleming valves or crystal detectors, and usually two of them are connected in parallel and in opposition.

In the figure reproduced herewith, which shows one of the many forms of apparatus described, two Fleming valves are employed, one of which acts as the detector and the other as the variable conductor. The aerial, A, is connected to the earth, E, through the condenser, C1, inductance, L, and primary, P. The secondary, S, is connected to the condenser, C2, and across this condenser are the valve receiver, D, and telephone, T. The variable conductor, V, is connected in parallel with the receiver, D. The filaments of the valves, D and V, are rendered incandescent by the current from the batteries, B1 and B2, passing through the adjustable resistances, r1 and r2, respectively. R1 and R2 are potentiometers for varying the voltages across the valves, and thus adjusting their sensitiveness so that the detector, D, is affected by the received signals, while the valve, V, is affected by powerful atmospherics. When the circuits are in tune, signals can be received in the telephone, T, if they are not sufficiently strong to affect the variable conductor, V, but if a powerful atmospheric discharge occurs, the valves, D and V, become almost equally operative, and being in opposition no rectification takes place, and no sound is produced in the telephone, T.



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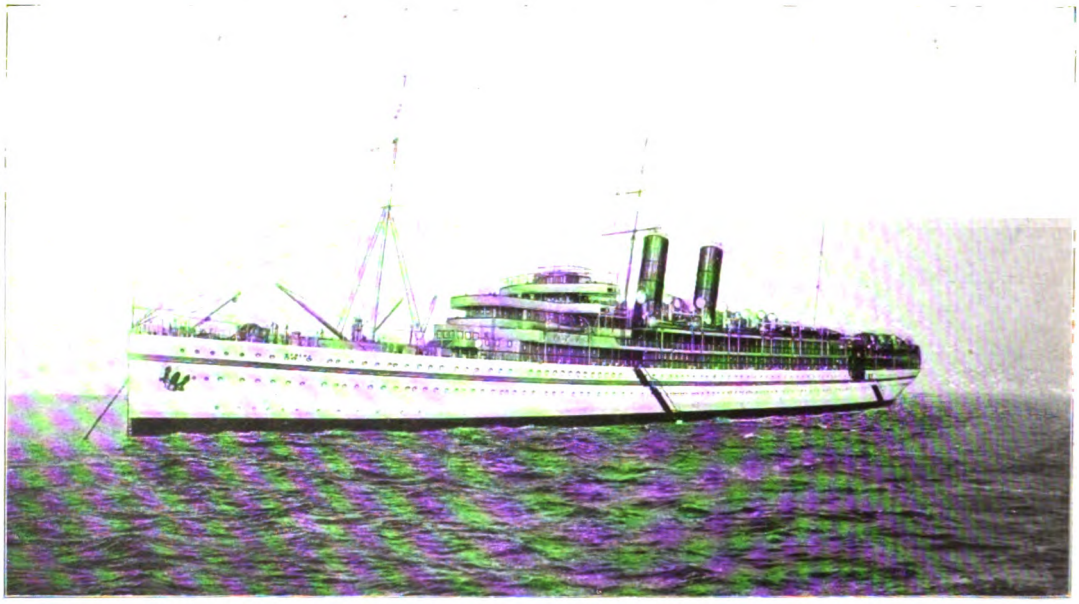
Voyage of King George to India

Historic Services of Wireless

ON November 11th, for the first time in the country's history, a British Sovereign left the Motherland to visit an Empire across the seas. This, in itself, is an episode of sufficient importance to fill an imperishable chapter in the history of Great Britain. But we wonder whether the student of the next generation, or even of the next decade, will regard the Royal visit to India, or the circumstances attending that visit, as of greater significance. Throughout practically the whole of the long journey to India, King George is enabled to be kept in as close touch with all that is transpiring at home, by means of wireless telegraphy, as if he had retired to Balmoral, while a loyal public are kept informed daily of the Royal progress in the direction of the great Dependency. The "Medina," on which the Royal party are making the voyage, is equipped for Marconi wireless telegraphy, which has already been described in these columns. One of the first messages sent by wireless from the "Medina" conveyed the King's thanks to the General Officer in Command at Aldershot for the good wishes expressed on behalf of the troops. On November 13th, Senhor Arriga, the President of the Portuguese Republic, sent the following wireless message to King George and Queen Mary on board the "Medina": "Knowing of the passage of your Majesties in the vicinity of Portuguese waters, I send your Majesties greetings in my name and in that of an allied nation, at the same time wishing your Majesties a pleasant voyage and all prosperity."

The "Medina" and the detached squadron were then making steady progress on their way down to Gibraltar. Wireless reports from the squadron to the Meteorological Office, published in *Daily Weather Report* of November 13th, showed that the ships passed from the Channel to the Bay of Biscay well to the westward of Ushant, about breakfast-time on Sunday, having run out of the rainstorm of the night into fair weather. It was ascertained, also by wireless, that the south-westerly gale had veered to a point or two northward of west, and maintained its strength of about forty



H.M.S. "Medina," on which King George and Party sailed to India for the Durbar

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miles an hour to the accompaniment of a rough sea and a temperature of 50 deg., or 4 deg. colder than London. By eleven o'clock the ships were on the Bay, in latitude 48 deg. N., longitude 6 deg. 18 min. W., and making the usual south-westerly course down the face of the Bay. Later wireless reports showed that at six o'clock on Sunday evening they had reached 46 deg. 30 min. N., 7 deg. 19 min. W., the gale had moderated to a high wind from between west and south, the sea still rough, but the weather continued fair and cold, the barometer rising.

The next event is of special importance, and would alone serve to make wireless for ever famous, inasmuch as for the first time in history the *Court Circular* was despatched by wireless telegraphy. Below is an exact copy of this historic despatch :

Court Circular.

H.M.S. "MEDINA," GIBRALTAR,
NOV. 15.

(By Wireless.)

The King and Queen arrived at Gibraltar last night. This morning their Majesties received the Governor-General, Sir Archibald Hunter, the Governor of Algeciras, the Governor of Cadiz, the captain of the Spanish cruiser "Reina Regente," the captain of the Portuguese cruiser "Adamaster," Vice-Admiral Sir John Jellicoe, Vice-Admiral commanding the Atlantic Fleet, the captains of the ships of the Atlantic Fleet, Rear-Admiral Frederick Pelham, Admiral Superintendent and in charge of all naval establishments at Gibraltar. H.M.S. "Medina" sailed at 10.30 a.m. for Port Said.

Thackeray, whose dislike of the *Court Circular* was almost an obsession, would have been especially interested in its issue for the first time on November 15th "by wireless," as it is carefully described in the heading, from Gibraltar. It is, in any case, a wondrous development from "the good old days," when the *London Gazette* of January 10th, 1695, could calmly announce from Edinburgh, under date eight days before, that "We received last night late by a flying Packet from Mr. Secretary Johnstowne, the sad and surprizing News of the Queen's Death," Mary II. having passed away on the previous December 28th.

The P. and O. steamer "Mantua," which arrived at Plymouth on November 16th, reported that just before midnight on the previous Sunday communication by wireless telegraphy was established with the "Medina," and the following message was despatched :

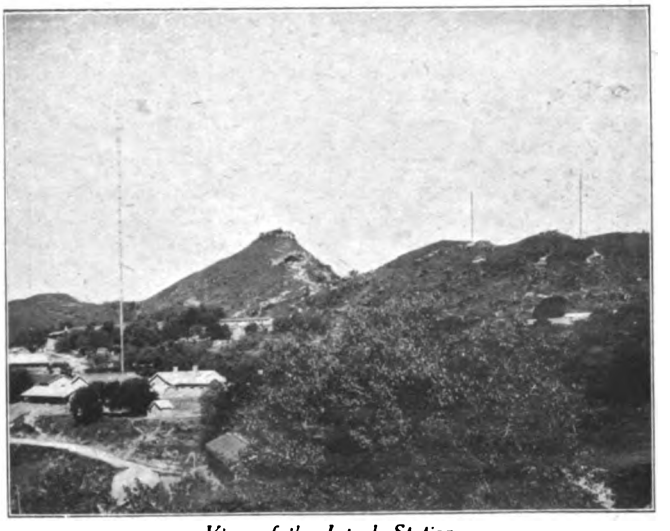
"The captain, officers, and passengers beg to be allowed to convey their humble duty to their Majesties, and to wish them a very prosperous voyage and a happy return home."

A reply expressing their Majesties' thanks was received.

The King and Queen of Spain received from the King and Queen of England a wireless message sent from the "Medina" to Gibraltar on November 14th, and retransmitted thence at 11.35. Their Majesties stated that on arriving off the Spanish coast they saluted with all affection the Spanish Sovereigns, and wished them every happiness. The Spanish Sovereigns despatched the following reply :

> Profoundly moved by the affectionate message which Ena and I have just received. We send you our affectionate greetings, and fervently trust that you may have a most happy voyage, and that your stay in India may be a most pleasant one.
>
> (Signed) ALFONSO.

Thus has Mr. Marconi's great invention given an immortal example of its utility. The many daily incidents concerning wireless, which prove the same thing, are liable to be overlooked because of their great number ; but for King George to take a lengthy sea voyage and remain in regular communication with the Mother Country by means of wireless telegraphy is a feat which will stand out as one of the most remarkable of the age.



View of the Jutogh Station

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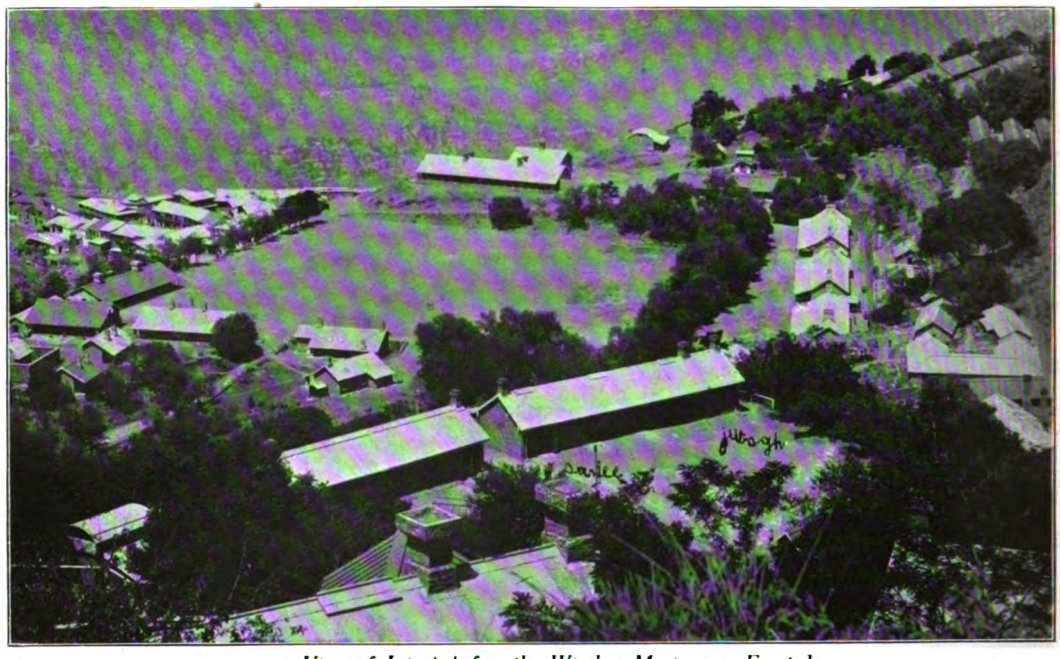
Marconi Stations in India

By Lieut. R. R. COOKE

AT the moment when the great Indian Durbar has made the Dependency the cynosure of all eyes, and when the imagination is fired by the occurrence of so historically significant an event, it is opportune to place on record the approach of the completion of an undertaking which is destined to play an important part in the future development of India. Needless to say, the undertaking alluded to is the four stations now being erected by Marconi's Wireless Telegraph Co., Ltd., to the order of the Indian Government, at Calcutta, Allahabad, Delhi and Jutogh. There is a touch almost of magic in the coincidence which places in juxtaposition a ceremony symbolic of ancient custom with one representing so remarkable an advance in a vast region of unexplored science as does wireless telegraphy, and the effect is heightened when it is borne in mind that through the instrumentality of Mr. Marconi's brilliant achievements King George and his gracious Consort are able to keep in touch with events in the outer world while on the overseas journey to India.

The four stations now in course of erection represent only the beginning of a more ambitious scheme, and it is safe to predict that succeeding years will witness a gradual increase in this number, particularly inland.

It is a significant fact that the four stations now in course of erection are in strongly fortified positions; three are in forts which cannot be overcome except by heavy artillery, while the fourth, that at Jutogh, is situated about six miles from Simla, where native risings are unknown. Other stations which are contemplated are also to be placed in fortified positions, which shows that the Indian Government will suffer no interference in wireless communication in the event of any native risings.



View of Jutogh before the Wireless Masts were Erected

The stations are fitted with three main waves—namely, 300-600 metres, 600-1,200 metres and 1,200-2,500 metres. The reason for

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the above arrangement, which complicates the interior of the stations considerably, is obvious. The shorter wave length is for direct communication with field and portable sets on active service. The next is presumably for use with a large number of fixed stations of small power which will probably be built in the future at, say, 100-150 mile intervals, and which will in turn communicate with sets in the field. The longest wave is for communication between the large stations themselves.

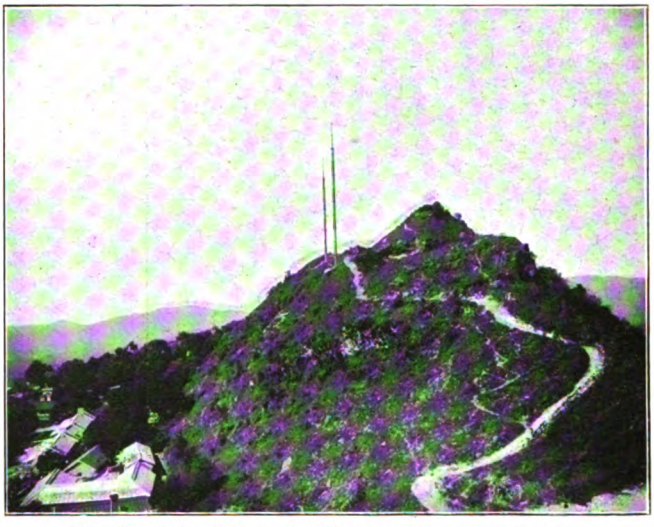
With regard to traffic, the idea at present is that all the stations shall act as adjuncts to the line telegraph service. In course of time it is possible that the Army will take over the management, care and maintenance of these stations, and if that is the case, I venture to predict that military business will grow to such huge dimensions that the stations will be inadequate to cope with the great amount of commercial work.

The three stations at Calcutta, Allahabad and Delhi contain 30-kw. installations, which are in each case self-contained within the walls of a fort. A 60-B.H.P. modern oil engine drives a 40-kw. generator for charging a large battery of 120 cells, the capacity of the battery being 613 ampère hours at a three-hour rate. A motor run from this battery and direct-coupled to a 1,000-volt 200-cycle alternator supplies current through suitable switchboards and instruments to a 30-kw. transformer.

The transformer is connected across a 24-inch disc through a high-tension signalling key and suitable high-frequency choking coils. The 1,200-2,500 wave length is obtained from a battery of 64 Poldhu cells in series with the primary of a jigger, whose secondary is in the base of a large transmitting aerial; in fact, it is the ordinary coupled jigger and disc discharger. The other two waves are obtained in a different manner. The large condenser and disc are charged from the transformer, but the secondary of the jigger is connected across the fixed spark-gap of the primary of a smaller set, 4 and 16 Poldhu cells respectively. This smaller set has a secondary which is connected in the usual way to aerial and earth. The object of the above arrangement is to enable the station to send out widely differing waves, using only one motor-alternator, one transformer and one disc. It will be noticed that the musical note of the disc is emitted whatever wave one is using.

At Delhi two old sets of oil engines and dynamos, for which no other work could be found, have been requisitioned in the wireless house for the supply of current through a booster to the accumulators. Jutogh is a 5-kw. station.

At all stations a receiving aerial is fitted, and messages are received either by magnetic or by the newest pattern of valve detector. The aerials at the large stations are 9-wire for sending and 2-wire for receiving double L's. The total span is 1,200 ft., and the total breadth 200 ft. In addition, a small aerial, 320 ft. long, is fitted for short-wave transmission. These aerial systems are supported by six masts each 260 ft. high, and the whole aerial and mast system is well up to the capacity of the stations. The masts themselves are made of steel half-cylinders bolted together, and I have nothing but praise for the ease and speed with which the masts may be erected, and for their graceful appearance.



The Road Leading to the Wireless Station at Jutogh

At Jutogh, of course, the aerial system is smaller. It consists of an L with a span of about 730 ft.; receiving aerials and short-wave aerials are fitted as in the other stations.

The great undertaking was commenced with the Jutogh station, when a number of unforeseen difficulties, chiefly transport, marred the smooth progress of operations. Simla is served by a metre gauge railway. The road from the railway station to the wireless station would put to shame the troubles which I understand

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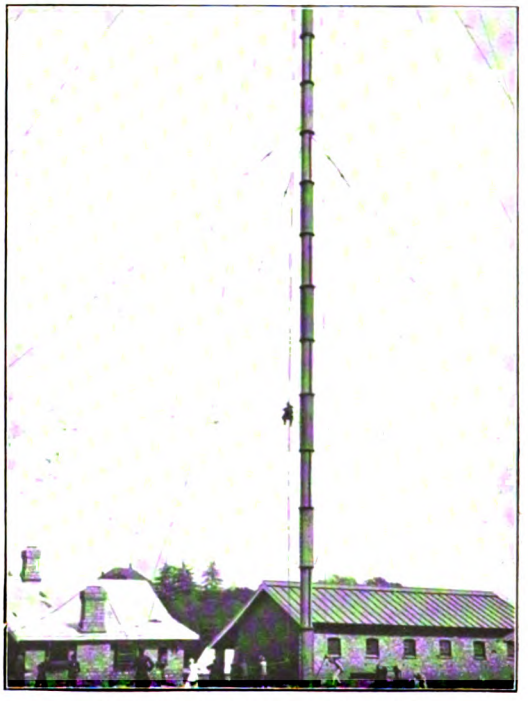
confront the Road Board in England. It is a quaint, crumbling path, over which the generating machinery was drawn on native trolleys by a heterogeneous crowd of natives, representing about half a score of tribes. The native labourers accompany the performance of their duties with a monotonous music. "Lah-illah," cries out the soloist; who is answered *fortissimo* by a chorus of "Hillallah" (which may be rendered as "God, my God"). In every gang there is one person whose business it seems to be to intone the solo, without which no work would be done. This person is evidently of some importance,



Main Mast at Jutogh, 260 ft. high

for if he should be made to forsake his muse for mundane work the whole gang are thereby insulted, and work suffers through their sulkiness.

On one occasion it took a gang of men a whole day to bring an engine from the station; several of the men had narrow escapes from being crushed under the wheels of the trolley, while it was almost a miracle that the engine reached its destination. At the end of the day's work the head man followed in the rear by the whole gang, came to me to beg a favour. He bewailed the fact that the roads were bad and steep, that the engine was heavy, that the men were tired, and so forth, without, however, stating the object of his petition. Visions of a demand for double pay began to float before me. I therefore cut short his petition with the demand to know what he wanted. Back came the immediate answer, "Sweets!" and a rupee divided among some forty men made them all happy. Several times later, after an extra hard day's work, sweets were distributed, until at last this became the recognised means of rewarding good labour. But one day a serious mishap occurred—no sweets were distributed! Then something actually did go wrong, and the explanation vouchsafed by the natives was that in the first place there were no sweets, and in the second place the work was so tiring that the workers were unable to pray for the success of the undertaking.

Jutogh has so far been the most interesting station from the engineering point of view; in other ways it is a very delightful spot. A vast length of snow-clad Himalayas can be seen about sixty miles to the northward, and when these glittering peaks are seen topping the nearer hills, whose sides are blood-red with rhododendron trees, or when the setting sun illumines the huge piles of snow-clad rock and tints it with all the colours of the opal, the sight is one to be remembered. The natives who dwell on the hills are as a rule very dull and lazy, but if they are judiciously controlled a considerable amount of work can be got out of them.

Delhi, the next station, presented no engineering difficulties. The labour problem caused anxious moments, however. There was such a great demand for labour in connection with the Durbar that the coolies were very independent, and not only worked badly, but betrayed their indifference by studied insolence. We bore up under this for several days, but had eventually to resort to stern measures, with magical effect. Delhi itself is a wonderful place. The fort in which the wireless station is erected is a huge frowning pile overlooking the city. Its walls are of a brilliant red stone, and rise 50 ft. or more from the surrounding ground level. The gates, of which there are two, are massive piles of stone crowned with rows of graceful turrets, and these give a perfect finish to the frowning entrances without in any way detracting from the grandeur of the pile.

Within the fort are a number of palaces, each more beautiful than the other. These comprise a gateway leading to the Dewan-i, or hall of public audience, which in turn leads to a handsome building in snow-white marble, where the ancient rulers were wont to give audience to their leading nobles. It is in this building that George V. will give audience at

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the forthcoming Durbar. Adjoining this building are beautiful marble halls, baths and living chambers; to a modern eye they appear tawdry with their tarnished gold leaf and their chipped and faded inlay, but what must they have been even seventy years ago, when their baths were inlaid with solid silver and their walls with gold?

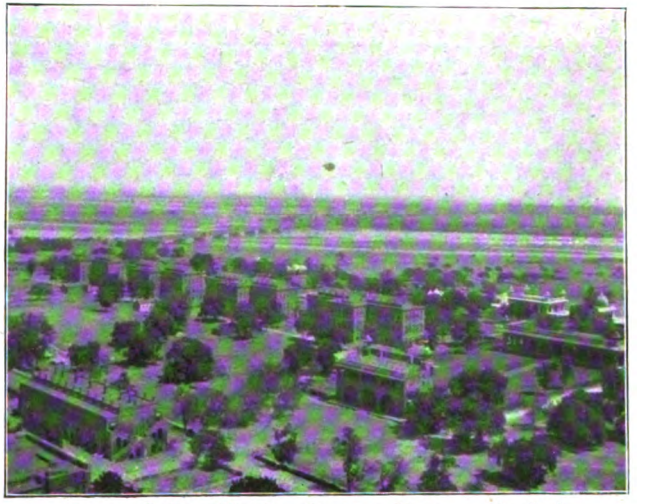
Akbar (*i.e.*, the Great), who lived between the years 1542 and 1605, built this fort and part of the palace. He was one of the wisest of the Mogul emperors of Hindustan, and the greatest Asiatic monarch of modern times. His reign is almost contemporary with that of Queen Elizabeth in England. He waged wars and extended his borders—for no Oriental monarchy could then be imagined which did not aim at conquest; and as a soldier and a conqueror he showed the highest qualities, but in the virtues of peace he was supreme among all Oriental monarchs. Near the fort at Delhi are a succession of huge crumbling ruins. This stretch of silent ruins sheds a glimmer of light upon the life of the ancient emperors. It recalls that tragic ending of Hamayun, the father of the Great Akbar, who fell and broke his neck while gazing at his fate in the stars; half a mile away he sleeps in a little tomb covered with a blue and gold dome, with his court jeweller close beside him. In the midst of these ruins, eleven miles from Delhi, stands the Tower of Victory, a massive granite pillar proclaiming to the world how the Mogul emperors were lords of India and omnipotent.

One would suppose that with such romantic surroundings the native of Delhi would see in wireless telegraphy some indications of the workings of Allah or of one of the numerous Hindoo deities. Not a bit of it. All the native wants is food and money; clothes do not trouble him, and he looks on wireless masts as so many large factory chimneys, with which the country is already thickly studded.

Allahabad station has just been started at the time of writing. It is quite straightforward, and presents no engineering difficulties whatever. The native there is such a poor specimen that one dare not reprove him lest he should break in twain. The fort itself is a holy spot from the Hindoo point of view. In an underground temple in the fort, through which millions of pilgrims stream in the course of the year, three rivers meet—the Ganges, the Jumna, and a third river which is said to run uphill from Benares through an 18-in. pipe.

Akbar, being a Mahommedan, when he conquered these people built a fort round their Hindoo temple, which was then above ground. After a time he permitted the temple to be used, but it has gradually sunk, until now the roof is well underground. Great difficulty was experienced in arranging the stays for one set of end masts so that they did not come through this roof.

Except for its holiness, Allahabad is uninteresting. Every other man one meets is a fakir, and every house a temple. There is a fairly large European population living well outside the town, and anyone with money to spend, and unlimited time to spare, can have quite an enjoyable time. The climate in the winter is bracing and dry, frosts occurring nearly every night, but in the summer it is a furnace—I have experienced a temperature of 116° F. there, and never want to try it again.



Fort at Delhi. Wireless Quarters Shown on the Left

Calcutta is simply a busy city where the majority of the inhabitants are black and wear flowing clothes. The wireless station here is in the fort, built this time by the English, and is chiefly remarkable on account of the steeplechase which the masts hold over barracks, guns, magazines, messes and all the other paraphernalia that one finds in a fort. Unless any unforeseen circumstances arise, all four stations should be finished early next March.

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The Imperial Durbar at Delhi

By E. E. LONG

FEW can realise, certainly none but those who have dwelt in India and who have come into close contact with her people, what the Imperial Durbar at Delhi means to India and to Indians. Pomp and pageantry have still their attraction for multitudes in the West; in the East, and particularly in India, they form the salt which flavours existence for the toiling masses; they provide almost the only excitement which breaks the dull monotony of their lives. But the Durbar which is to be held at Delhi is not a thing of pomp and pageantry alone: it stands for something far greater. Deep down in the heart of every Indian dwells reverence for kingship. In India to-day the divinity of kingship is the most popular and widely-held article of belief; and it is because for the first time in the history of British rule in India their King is coming to his Indian people, to be crowned in the ancient capital of the Mughals, to become the first English Delhi-ke-Bahshah, the first real English Lord and Emperor of India, crowned at Delhi, that Indians rejoice. King-Emperor of India, Kaisar-i-Hind, these have meant nothing to the Indian mind compared with what Delhi-ke-Bahshah will stand for. Now India will have its own King-Emperor, crowned in India's capital, amidst the plaudits of his faithful and loyal Indian subjects; and the tie uniting India with the Empire will be strengthened as nought else could strengthen it.

Native Erectors at the Delhi Wireless Station

Let us take a brief glance at the ground to be covered by His Majesty in his Indian Empire, for the honour of his presence is not to be claimed by Delhi alone. The barren rocks of Aden—India's gaunt sentinel—will flash him his first welcome. From the "wireless" masts of the "Medina" the news will speed to Aden's "wireless" station that the King is coming,

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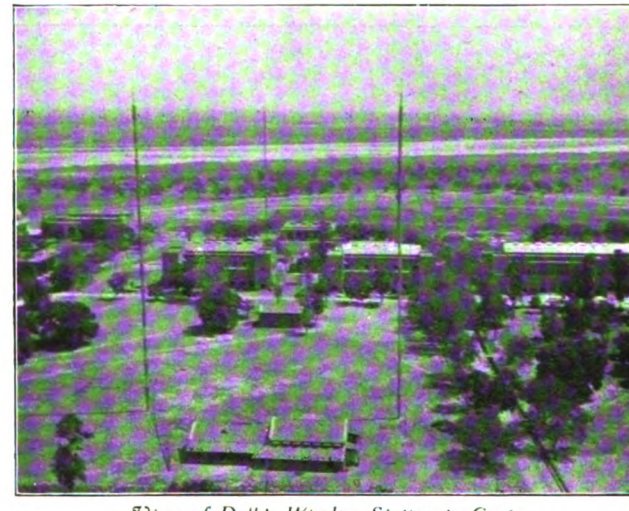
and Indian and English troops on Arabian soil will greet the Empire's ruler. Four days of calm, unruffled seas and gentle breezes—the angry south-west monsoon having vanished—wonderful sunsets and dreamland moonlit nights, and then, low-lying at the feet almost of the blue Ghauts, the roofs and spires of the city of Bombay will gladden the eyes of Their Majesties after their long voyage. Into the beautiful harbour, sand-fringed and bordered in places with graceful waving palms—an exquisite setting—the "Medina" will pass to the accompaniment of thunderous applause from the forts, low-lying, just above the water's edge, and King George will pass in state through Bombay, gift of the Braganzas, together with Princess Katharine, to Charles II. of England, and held for years as a royal possession overseas before it passed under the *régime* of the Honourable East India Co. Fitting, indeed, that the King of England should land here — in the city of his ancestor!

From Bombay His Majesty will journey to Delhi, over a noble railroad—marvel of engineering skill, ascending, winding and twisting, and descending its tortuous path through the Ghauts—and on through the Deccan—abiding place of the once fierce Mahrattas, who, from their strong hill fortresses (the ruins alone are there to-day), issued forth to plunder, to ravage and to kill, laying waste the rich plains beneath them, and succeeded eventually, under the dreaded Sivaji, in striking terror into Mughal hearts in far-away Delhi—to the North. Waving fields of cotton and of corn now greet the eye here, and the peasant sleeps securely, his mind at rest, under the rule of the British Raj. On through the picturesque, independent State of Bhopal, whose wonderful woman ruler greeted King George in his own English capital last summer; on to the Punjaub—to the city *of* cities, and *among* cities, to a city whose splendours were the glory of a past age—whose splendours are to be revived to-day.

What shall one say of Delhi? It means so much—to an Englishman. It awakens such memories. All around lie mighty memorials of a great past. But the memories awakened first and foremost in the English mind are those of a period which has passed, never to return, but which can never be forgotten; a period when before the walls of Delhi some of the noblest of England's sons fell engaged in the heroic and successful task of maintaining Britain's name and reputation and British rule in India against countless odds. Just north a mile from the walls of Delhi, encamped on a low range of hills known as the ridge, for many long weeks in '57 the fate of British rule hung in the balance. Led by the hero, John Nicholson, who fell in the hour of victory, those walls were breached—the breaches are visible to-day—and through the Kashmir gate, blown down by a gallant band of heroes, who perished in their task, Englishmen and Indians advanced to restore peace and order to Delhi. Englishmen and Indians laid down their lives together in those weeks of blood; to-day Englishmen and Indians, in the presence of their King, beside that red ridge of Delhi, will rejoice together, and pledge themselves anew to the great task of shaping aright the destiny of a mighty nation.



View of Delhi, Wireless Station in Centre

Delhi, the modern Delhi, has marble palaces whose glories still thrill the soul and fire the imagination. The Dewan-i-A'am and the Dewan-i-Khas still are worthy of sheltering an emperor; but Delhi is becoming rapidly an industrial city: it has electric trams, mills, and—wireless telegraphy. Here, indeed, East meets West, with Mr. Marconi as the latest mercurial messenger to have bridged the great gulf which once lay between. And at present Delhi is more modern than ancient, for out beyond the ridge for miles lies the most modern camp that ever was, with all the latest appliances of a civilised age; and, in the midst of a wide plain, in some of its aspects not at all unlike an English rural scene, with no tropical richness of flora, and in a climate bright and

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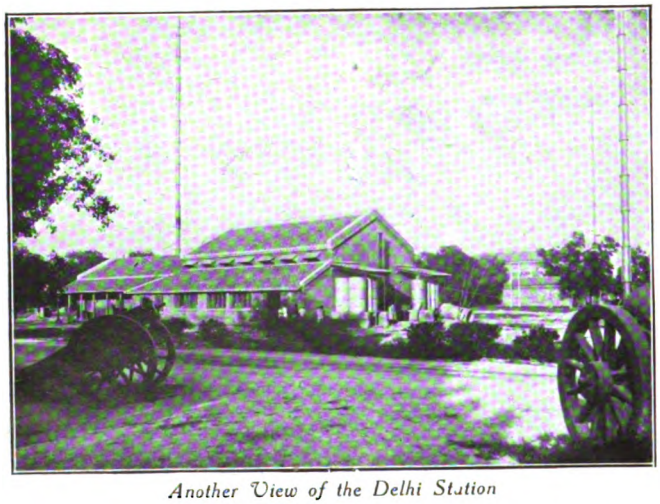
bracing at morn and night, sometimes frosty, but genially warm at mid-day, reminding one of a clear December day in England, King George and his Royal Consort will assume the symbol of kingship in the presence of a huge multitude, the splendour and rich variety of whose costumes alone will give to the ceremony that touch of Oriental magnificence with which all associate it.

After a round of ceremonies and festivities in Delhi, shared in by everyone of note in the Indian Empire and the great British Dependencies in Asia, King George goes to the far-stretching jungles of what is known as the Nepaul terai—the thickly-wooded territory which runs along at the base of the giant Himalayas, where hordes of animals of prey, large and small, and in particular the tiger,



Another View of the Delhi Station

lurk in malarious fastnesses, from which to dislodge and kill them it is the sportsman's delight. His Majesty is known to appreciate the opportunity of *shikar*, as game hunting, large and small, in India is termed, as much as anything his Indian visit offers, and accordingly, whilst he is away in the Terai, Her Majesty will rest in Agra—the holy city of Islam in India—the site of the world's fairest and noblest building, the Taj Mahal. A dream in marble when seen, as it should be, by moonlight, it is as though it were suspended from heaven by cords invisible, and one trembles as one gazes on its beauty, so far above the work of mortal hands it seems to be.

Then Their Majesties meet and proceed to Calcutta, that great metropolis—lasting tribute to British pluck, endurance, energy and foresight. Second largest city in the British Empire, its foundation was the outcome of the determination of one single stout British heart to overcome adversity, to ensure success. Worthy Job Charnock created Calcutta and laid his countrymen and the people of India under an everlasting debt; and to realise what that debt is Calcutta must be seen. Of no historical worth, except in the story of English colonial enterprise—then it has no rival—Calcutta is the centre of a world-wide trade. It has industries which are peculiarly its own, factories of a dozen types, and, more, public buildings that would grace any European capital, gracefully-planned thoroughfares, a racecourse which attracts in the cool, pleasant weather of late December and early January a crowd resembling in fashion that of the English Ascot, and theatres and hotels so Western in character that in the height of the season it is difficult indeed to realise that one is in an Indian and not in an English city. One says this of the best and most European parts of Calcutta, of course; the city has its other side—foul slums and nasty, narrow winding streets where dwell thousands of Indians of a score of races, ranging from the fair Rajput of the north, with complexion akin to that of a southern European, to the almost black tint of India's darkest race—the Tamil, of the south; and of the complexion tints between a dozen might be classified. Calcutta will give a royal welcome to India's King and Queen—fresh from the ceremony at Delhi. A pageant on an enormous scale, illustrative of the history of the great Empire of India, has been arranged, and that spectacle may well rival the Delhi Durbar in magnificence. But nought that can be done in Calcutta, or elsewhere, will in any way equal in significance that Imperial ceremony about to be enacted in Delhi, which will give India its own King after the lapse of ages, and prove to be the crowning link in strengthening the mighty chain which binds together the great Imperial edifice in which India is the corner-stone and the greatest ornament.

The wireless coast station at Karlskrona in Sweden was temporarily closed as from November 1st.

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Wireless Services During Gales

THE appalling number of shipwrecks recently recorded, and especially during the gale which had so disastrous an effect all around the British coast during the past month, serves to emphasise once more the necessity for a wider application of the Marconi system of wireless telegraphy to our mercantile marine service. It is somewhat curious, too, that Britain, the leading mercantile nation, should compare with other countries like the primitive to the modern in this respect. In America the desirability of such communication is almost universally recognised, and on the lakes of Canada—that comparatively new, but wonderfully prosperous and progressive country—the Marconi system is in full operation, and this notwithstanding the fact that shipping can only be carried on for about six months of the year. Apart altogether from the commercial benefits that would necessarily accrue from the introduction of wireless telegraphy, what a world of anxiety and sorrow it would help to obviate!

No more convincing illustration of the extreme value of the wireless system of telegraphy can be given than in the following case which occurred during the recent gale:

The "Duchess of Devonshire," of the Barrow Line, which is fitted up with the appliances for the transmission and reception of wireless, was lying in the docks, and Mr. Kemp, the manager for Messrs. Little & Co., had word sent abroad inquiring the whereabouts of the "Dunure." The message was received by the steam yacht "Sapphire," which was lying at Campbeltown, and which sent back word that it had not seen or heard of the "Dunure," but that it would institute investigations. Subsequently a message was received at the local office of the Ayr Co. in Belfast that the "Dunure" had not left Ayr—an intimation that was most reassuring.

These and many other instances might be mentioned, but it should suffice to all who take an interest in those who go down to the sea in ships and do trade upon the great waters to sound the warning note that unless in this, as in other undertakings, Britain desires to be left behind in the race for progress and the happiness of the human race, there is urgent necessity for a speedy and universal application of wireless telegraphy to liners and our merchant vessels. Six months ago Mr. Kemp brought under the notice of the Harbour Board the desirability of establishing a wireless receiving station at Belfast. The suggestion was one of vast and far-reaching importance, and should receive the most careful consideration.

The public utility of the Tobermory and Lochboisdale wireless stations erected for the Post Office by the Marconi Co. has been fully realised since the recent storm so seriously disturbed the ordinary system. On the forenoon of November 7th, when the telegraphic communication between Oban and the South was still interrupted, the messages of the Oban district were being dealt with through Tobermory. Despatched from the latter station by wireless, they were received at Lochboisdale and sent to Stornoway; thence they were forwarded by the cable to Poolewe, and then on by land to Inverness, Glasgow and elsewhere. A message between Oban and Dunblane would have to go by this circuitous route, and only by the wireless spanning the gap was this curious arrangement possible. In the few miles between Lochbuie and Achnacraig, in Mull, about sixty telegraph poles were reported down. The staff at Tobermory have been making good headway in dealing with the arrears of work. Consequent upon the dislocation from Tiree, where no mails had been received between October 27th and November 6th, there was a great accumulation of messages.

Wireless in Fiji

The three wireless stations in Fiji have just been completed by the Marconi Co., including a 5-kw. station at Vatuwaqa (Suva), a 5-kw. station at Lambasa, and a 1½-kw. station at Taviuni. All these stations are working well. The former has communicated 2,200 miles at night, and has spoken Wellington, New Zealand, station (2 kw.), and steamers on the New Zealand coast on several occasions, with distances of 1,500 miles. The M.D. and valve are both installed at the larger stations in Fiji, which we hope to describe in a future issue.

A clergyman of Lautoka was recently fined £4 and costs for erecting a wireless plant on his premises in contravention to the Ordinance.

According to the *Madras Standard*, the extension of wireless telegraphy in India is now to be carried out systematically. A route from Calcutta to Jutogh, Simla, by way of Allahabad and Delhi (described elsewhere in this issue) was chosen in the first instance, and the installations are nearing completion. The next station to the north will be at Lahore, and this will be put in touch with Karachi. Later on Peshawar will doubtless be included in the system. In the west an installation is to be given to Bombay and another to Nagpur. Necessary funds will be provided next year.

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THE MARCONIGRAPH

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The Editor will be pleased to receive contributions; and Illustrated Articles will be particularly welcomed. All such as are accepted will be paid for.

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The Share Market.

The market in Marconi shares still continues an active one. The company has issued 187,500 ordinary shares at £2 to the ordinary and preference shareholders in the proportion of one in four. A considerable interest has arisen in the Canadian Marconi Company's shares.

Prices, November 24:

Marconi Ord. 46s. 47s. ex. rights.
do. Pref. 1⅞–2 do. valued at 1/16
do. New 4s. 5s. premium.
Canadian Marconi 14s. 6d.–15s. 6d.

Marconi's Wireless Telegraph Co., Ltd., in conjunction with the Compañia Nacional de Telegraphia sin Hilos, have instituted an action against the representatives of the Telefunken Company in Spain for infringement of patents Nos. 20041 and 26745 which correspond to the English patents Nos. 12039 of 1896 and 7777 of 1900.

The Marconi Wireless Telegraph Co. of America have commenced an action against the National Electric Signalling Co. (Fessenden System), for infringement of patent No. 763772, which corresponds to the English patent No. 7777 of 1900.

Messrs. Siemens Bros. & Co., Ltd., who are the representatives of the Telefunken Company in Great Britain, have applied to Marconi's Wireless Telegraph Co., Ltd., for a licence to work under patent No. 11575 of 1897.

The Functions of an Engineer.

At the first meeting of the new session of the Institution of Post Office Engineers, Major A. J. O'Meara, C.M.G., Engineer-in-Chief to the Post Office, delivered a short address. He referred to Sir William Ramsay's indictment of British methods in technical education, as expressed in his presidential address to the British Association. He endorsed Sir William's opinion that a fallacious idea prevails that the functions of an engineer correspond to those of a foreman; he believed that a great amount of injury was being done by "quack" engineers, and considered that there should be some system of registration before a young man was admitted to practice as an engineer. He admitted that there was a difference of opinion as to the value to be placed on a scientific degree, and suggested that, in substitution for the present requirements for a degree, some means should be found for marking down a man's qualifications in such a way as to indicate his ability to apply his theoretical knowledge effectively in an organisation in which human beings, and not the materials used, constitute the factor of prime importance. In the meantime, however, he thought that the degree must be accepted as an indication of certain scholastic attainments, and that the employer himself must assess the value of the personal and practical qualities of each aspirant engineer.

Wireless Weather Reports.

The poor prophecies which have hitherto been made by the United States Weather Department in Washington have led the authorities to take steps to still further utilise the resources of wireless telegraphy in communicating to the Department the depressions

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at sea, which so seriously interfere with the weather in the United States. The Secretary of the United States Navy, Mr. G. V. L. Meyer, has issued instructions to all naval wireless stations on the Atlantic and Gulf Coasts to request special weather reports or observations from vessels at sea, whenever required by the Chief of the Weather Bureau, by telegram direct to the wireless station or stations concerned. Certain wireless stations named in the circular may be used to obtain the desired information. Those at the Navy yards at Boston, New York, Philadelphia and Norfolk are not prepared to obtain information from seaward; the nearest coast stations are at Cape Cod, Fire Island, Cape Henlopen and Beaufort respectively. Other naval wireless stations are at Cape Elizabeth, Portsmouth, Newport, Nantucket Shoals Lightship, Diamond Shoals Lightship, Charleston, St. Augustine, Jupiter Inlet, Key West, Pensacola and New Orleans. The Navy Department are co-operating with the Department of Agriculture in obtaining weather reports. When a request is received from the Chief of the Weather Bureau to the wireless station under the control of the Navy Department special weather reports are to be obtained from vessels within range, a request for such reports being sent broadcast by wireless at the hours mentioned for disseminating storm warnings. These special reports received from vessels are to be sent immediately by wire to the Weather Bureau. In addition, whenever messages other than private are received by wireless stations from passing vessels indicating a disturbed condition of the weather, this information must be forwarded to the Weather Bureau direct; if this information is contained in a private message, the master of the vessel is requested to make a weather report.

Another Wireless "Wonder."

Most people have read Hans Andersen's fable of "The Emperor's New Clothes," a suit made of a material visible only to those who were fitted for their office, and will remember how, when the emperor walked in procession through his capital, the beauty and fit of his garments excited universal admiration. This satire on the gullibility of mankind seems overdrawn, yet in these days we have an almost perfect parallel in the attitude not only of newspaper correspondents, but of a large portion of the general public towards many subjects that are for the time being under consideration. Perhaps in no case is this gullibility more evident than in the reports concerning man's struggle to wrest from Nature her inscrutable secrets. The *Daily News* recently announced the claim of a gentleman from Leeds to have "discovered a system of secret wireless transmission which will revolutionise the science." It appears that this ingenious inventor had converted his bedroom into a wireless telegraph station, and "has been making experiments both day and night during the past few months." "The system of wireless at present in use has," so the inventor confided to the *Daily News* correspondent, "one serious drawback. Any message can be intercepted and picked up by any receiver; and such a system might easily defeat its purposes in case of war." Then he goes on to claim that the wireless installation which he has perfected removes this danger. And this is how it is done: "I have succeeded in transmitting a message for a distance of 28 feet which could only be picked up by the corresponding receiver of my invention. If such can be done—and I repeat I have done it—in regard to short distances, there need be no difficulty in regard to long distances. I go further, and am ready to prove that over ten thousand messages can be sent with absolute privacy from my transmitter in a very short time. Not one of those messages could be intercepted. I have no doubt that secret messages could be transmitted like the present wireless ones across whole continents and oceans." We await the promised proof with equanimity. Meanwhile it is rather disappointing to learn that the inventor is about to forsake these hospitable shores and to take up his residence in America, where the climate is more favourable to the newspaper development of sensations.

Wireless and Kites.

A notice issued by Mr. W. H. Alnehurst, hon. secretary of the Kite and Model Aeroplane Association, states that a Volunteer "Motor Man-lifting" Kite and Wireless Telegraph Corps is about to be founded. The equipment of this corps will include a motor man-lifting outfit, with winding gear and a 25-30-h.p. petrol engine. All this equipment will be mounted on a motor chassis which will be capable of carrying sixteen men, besides officers and driver. The kite equipment will be of the Cody type, and of the pattern and materials used by the Royal Engineers. The estimated cost of the whole equipment, including maintenance for two years, is about £700. The men are ready to train, and are only waiting for the equipment. An appeal is therefore made by the Council of the Association for contributions towards this object. The address of the hon. secretary is 27 Victory Road, Wimbledon, London, S.W.

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Australasian News

Facilitating Shipping.

The advantages of wireless telegraphy have been again demonstrated in connection with the shipping of the Port of Hobart. The ss. "Manuka," from Melbourne, was hourly expected to be reported passing Eddystone on a certain day. Up to a late hour in the afternoon no word had been received of her, and friends of passengers and the shipping company had no idea what time she would arrive at Hobart. However, as the ss. "Ulimaroa" was leaving Hobart for Melbourne she was spoken by the ss. "Manuka," and informed that the vessel was nearing the Tasmanian coast. The weather was unfavourable, there being a strong south-easterly wind, with seas and passing rain and hail squalls, and the atmosphere was hazy. Captain Neville expected to reach Hobart by 5 a.m. on the following day provided the weather improved. The receipt of the message enabled the company to make arrangements for the discharge of the "Manuka's" cargo without taking the waterside workers to the wharf to await the vessel's arrival for an unreasonable length of time.

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Postal Regulations.

The Australian Postal Authorities have issued regulations which provide for the issue of general licences at a cost of 5s. each for ships registered in Australia, and of 21s. for experimental licences. According to the regulations, the appliances on ships are to be worked in such a way as not to interfere with the naval or military signalling or the transmission of messages between other wireless telegraph stations, and, except by permission of the Postmaster-General, the wireless telegraph appliances in any Australian, British or foreign ship (other than a ship of war) are not to be worked while the ship is in any harbour or any territory of the Commonwealth. Power is given to the Governor-General to prohibit the use of wireless telegraphy on board foreign ships in territorial waters in the case of emergency. Any officer in command of any ship of war in the Imperial or Colonial Navy, or in command of any part of the defence force, is empowered to take possession of the wireless appliances of any ship or any experimental apparatus, and to use them in the King's service. He may also direct the licensee or person in charge to submit to him any or all messages received or tendered for transmission or delivery. "Reasonable compensation" will be payable for any damage done in the exercise of these powers.

Compulsory Wireless on Ships.

Correspondence has been passing between the Imperial Government and the Commonwealth Government on the Navigation Bill. In clause 234 of the Bill, giving powers to require installation of wireless telegraphy on ships carrying passengers to the prescribed number, it is suggested that in the regulations the Commonwealth will have regard to the number of land stations with which the vessels could communicate in case of need. The question as to the number of passengers which shall make foreign-going vessels liable to be fitted with the apparatus is one which it is felt will be considered with reference to all the interests affected. The Board thinks that the vessels on which compulsory installation seems most fitted are those carrying a considerable number of steerage passengers.

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At the South Pole.

There seems to be no doubt that Mr. Douglas Mawson, who is in charge of an expedition in search of the South Pole, will get enough money to allow of the establishment of wireless telegraphy between a chosen base in the Antarctic and some station in Australasia. Meteorologists are expecting to benefit considerably from this. Moreover, the station Mr. Mawson proposes to erect will keep us in touch with the expedition, and will rob that expedition of one of its chief hardships—the enforced deprivation of all news of the outside world, and the dreary isolation which weighs so heavily upon the spirits of the Polar explorer.

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The Triumphs of Wireless.

Speaking recently at a Letter Carriers' Society at Wellington, New Zealand, Sir Joseph Ward said that a high-power wireless station would be erected in Wellington. It had been intended that the power should be two kilowatts, but that had been extended to five. The station would be powerful enough to get into touch with Western Australia at night time, while in the day time communication could be carried on with ships within a few hundred miles of Sydney. It was contemplated, too, that the system should be extended to the Chatham Islands and Raratonga, the latter place being connected with Tonga. He hoped that before long a system of wireless stations across the ocean between the Motherland and the Oversea Dominions would be perfected.

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What Tasmania Requires.

Although the Federal Government has announced its intention of establishing wireless stations on the Australian coast, it has not yet been intimated that Tasmania is to be included in the scheme. Admiral Sir Reginald Henderson, when reporting upon Commonwealth naval matters, included in his recommendations a wireless station for Hobart and Beauty Point, River Tamar, which he selected for sub-bases. He did not, however, recommend this as part of the first scheme to be developed. Since that report was made great advances have taken place in the equipping of the merchant steamers with wireless telegraphy, and if there is no need for the immediate installing of wireless stations in Tasmania from a naval point of view, there is from the standpoint of public convenience. The mail steamers of the New Zealand Shipping Co., and Shaw, Savill & Albion Co., running in the London, South African, Hobart and New Zealand service, have all been equipped with wireless, and the Union Co.'s and Huddart Parker Co.'s New Zealand and inter-State steamers have been, or are being, equipped; while vessels of the White Star, P. & O., Orient, Aberdeen and Ocean Steamship Companies, which call at Hobart in large numbers in the fruit season, also carry the apparatus. Though the distance from the Australian and New Zealand ports is not very great, and the steamers can generally be relied upon to arrive at an approximate time, it frequently occurs that bad weather causes delay, and the receipt of a wireless message would save hours of tedious waiting and uncertainty, and greatly facilitate business. Cases happen where a vessel is expected to arrive at a certain hour at night, and waterside workers turn out in readiness to handle cargo; the steamer gets delayed, and they wait up in all weathers for hours for the ship to arrive. A wireless station would put an end to this. Then, of course, there is always the possibility of a breakdown or other disaster occurring, and a vessel needing urgent assistance, perhaps with many hundreds of passengers aboard, quite possibly off the Tasmanian coast; it may be that assistance could be quickest rendered from Hobart. It has happened that English and inter-State mails and passengers coming by steamer from Melbourne have missed the express at Launceston by half an hour because the whereabouts of the vessel were not known to the railway department. A wireless station in the North would prove of great utility in cases such as that, or where a vessel was delayed by fog or other causes. Instances have happened where London mail steamers wished to send a wireless message to Hobart for coal in order to facilitate their despatch. Finally, an Australian expedition is on the way to the South Polar regions, and is likely to be fitted with the wireless apparatus. If there was a station in Hobart daily communication could be had with her while she is away. As a matter of fact, wireless telegraphy has become a great public convenience and public necessity, and its value in securing urgent help to vessels in distress at sea is coming under almost daily notice. Tasmania cannot afford to be without a wireless station any more than other important centres can.

New Zealand Telegraphs.

The annual report of the New Zealand Post and Telegraph Department makes reference this year to the installation for the Government of two high-power and five low-power wireless stations in the Dominion. The importance of erecting such stations has frequently been urged by the commercial community, as well as on grounds of Imperial unity and national defence.

A Reminder from Leith

The report of the governors, read at the eighth ordinary general meeting of Leith Nautical College, stated that in view of the great and increasing number of vessels fitted with wireless telegraph installations, and the desirability of affording instruction of the working of these to officers and others, they were considering the addition of that apparatus to the equipment of the college, subject to their obtaining a considerable proportion of the cost from the Scotch Education Department. The chairman, in moving the adoption of the report, remarked that there was not the slightest doubt the Board of Trade were placing more and more weight upon the installation of wireless apparatus, and he thought it was only a question of time when the Board of Trade would require every passenger vessel to be fitted with the wireless apparatus. Provost Smith seconded, and the report was adopted.

"Patsy," in a letter to the *Times* on November 17th, invites the attention of the Lords of the Admiralty to the necessity for providing aeroplanes for the Navy, and argues that, "as with the wireless, which has been developed from Marconi's beginnings till it is probably the most efficient wireless service in the world, so should attention be given to the development of aeronautics, thus giving the Navy the chance to make that branch of the service as efficient as submarines and wireless have become."

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Reviews of Books

"ELECTRICAL ENGINEERING," by Harold H. Simmons. (London: Cassell & Co., Ltd. Part I., 7d. net.)

This useful work is being issued in fortnightly parts, the first of which has just made its appearance. The plan of the work is well laid out, and in a later section, electric oscillations, electric waves, and wireless telegraphy will be dealt with. Part I. deals with circuits and conductors and primary and secondary cells. As a knowledge of the fundamental principles of electricity and electrical engineering is essential to a thorough understanding of wireless telegraphy, we can recommend this work to the young engineer, apprentice, or layman who desires to study the subject.

"ENCYCLOPÆDIA BRITANNICA." (Cambridge, 1910: The University Press.) 29 Vols., averaging 960 pages per volume. Price varies from 18s. 6d. to 33s. per volume, according to paper and binding.

We will not attempt to deal with the many features that distinguish this edition of a monumental work from its predecessors except to refer to an able article by Dr. J. A. Fleming on wireless telegraphy. The author commences with a summary of the early experimental work in telegraphy without direct or continuous conducting wires between signalling points. He leads off with a reference to Steinheil's important discovery in 1838, then proceeds to discuss the early experiments of Morse and Gale in 1842. Morse was the first to demonstrate that it was possible to interrupt the metallic circuit in two places and yet retain power of electric communication. He arrived at this conclusion by successfully signalling across a canal with metal plates sunk in the water on the opposite banks at two points, with a wire along each bank between the plates, but no wire between the banks. It was found, however, that the distance between the plates up and down the canal must be at least three or four times the width of the canal to obtain satisfactory results; and thus this method of signalling was never likely to be of any great practical or commercial value. Nevertheless, experiments of the same nature were brought to public notice by J. B. Lindsay, as well as by J. W. Wilkins and H. Highton a few years subsequently; and again in 1880 Trowbridge drew attention to the fact that signalling might be conducted over considerable ranges by electric conduction through the earth, or water, between points not metallically connected, whilst pointing to the applicability of the method to inter-communication by ships at sea. Then Sir William Preece, about the same time, obtained improved practical results by combining together methods of induction and conduction in such a way as to affect one circuit by the current in another.

Reference is next made to the early accomplishments (by conduction through sea water) of Mr. Willoughby Smith and Mr. W. P. Granville for telegraphically connecting lightships and isolated lighthouses with the shore. Sir Oliver Lodge's early investigations then receive attention, including an allusion to his (the first) suggestion of "tuning" by the inclusion of condensers in the circuit. This is followed by a reference to Edison's proposal for telegraphy without directing wires by electrostatic induction, which was the forerunner of a system for communication between railway stations and moving trains. The author of the article does not favour the idea that Edison's proposal for elevated plates can be regarded as an anticipation of the Marconi aerial or antenna, on the ground that Edison did not employ any spark-gap or means for creating high-frequency oscillations in his wires. He (the author) further states that "there is no evidence that this plan of Edison's was practically operative as a system of telegraphy." This may well be so; and in much the same terms allusion is made to Prof. Dolbear's early patent of 1886.

The next section is on "Space-or Radio-Telegraphy by Hertzian Waves." As the author says, all the various forms of so-called wireless telegraphy previously referred to were completely overshadowed by Heinrich Hertz's scientific researches of 1886-7 in the production of electric oscillations. The gradual development of the subject is traced, and is followed by an interesting statement of what Mr. Marconi has done for the practical development of radio-telegraphy.

It has been decided to establish an Admiralty station at Blyth, with wireless telegraph facilities.

A wireless message received on board H.M.S. "Impericuse," at Portland, conveyed the news that during the passage of the Second Division of the Home Fleet from Berehaven to Portland, Commander Frederic George Brine was washed overboard from the battleship "St. Vincent," the flagship of Rear-Admiral Richard H. Peirse. Apparently the ship encountered very heavy weather, for the marconigram adds that the unfortunate officer was lost sight of from the moment that a wave carried him overboard, and was never seen again.

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Diary of Events.

1897.

December 18th.—Tests were made between the station at Alum Bay and a steamer, the height of the mast being about 60 ft. Readable signals were obtained up to 18 miles.

1898.

December 24th.—Demonstration of the utility and value of wireless telegraphy as a means of communication between lightships and shore. Communication between the East Goodwin Lightship and the South Foreland Lighthouse—a distance of 12 miles—first established on Christmas Eve.

1901.

December 12th.—Mr. Marconi received signals at St. John's, Newfoundland, from Poldhu, Cornwall, a distance of 1,800 miles across the Atlantic.

December 21st.—Stations for commercial wireless telegraph working opened at Malin Head and Inistrahull.

1902.

December 16th.—Message to the *Times* by its correspondent from Cape Breton station.

December 20th.—Mr. Marconi sent messages from Cape Breton through Poldhu by wireless to the late King Edward, the Earl of Minto (then Governor-General of Canada), and on December 21st to King Victor Emmanuel of Italy—a distance of 2,270 nautical miles.

1903.

December 8th.—The "Kroonland," from Antwerp to New York, when 130 miles west of the Fastnet, disabled her steering gear. The vessel was fitted with Marconi apparatus, and communication was established with Crookhaven, through which the captain sent messages to the vessel's agents in Antwerp giving particulars of accident. Within an hour and a half a message was received from Antwerp instructing the captain what to do.

December 19th.—An agreement made by Mr. Marconi with the Italian Government for the erection and working of a station at Bari.

1909.

December 10th.—Mr. Marconi was awarded the Nobel Prize for Physics, and on the following day delivered a lecture at the Royal Academy of Science, Stockholm.

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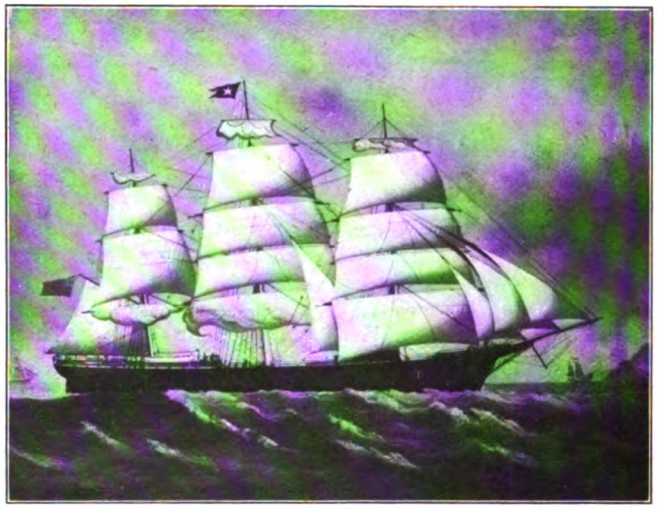
Rulers of the Ocean

I—THE WHITE STAR LINE

GREAT BRITAIN has reason to be proud of her mercantile marine, which renders the country's claim to the supremacy of the seas indisputable. It is due to the wisdom and enterprise of her shipowners that the mighty fleet of ocean greyhounds now carry passengers and cargo with wonderful rapidity and safety over all the seas, and, in the case of passengers, with a degree of comfort that is even rarely met with on shore. The history of this development is wrapt up with the history of the great shipping lines. One has only to turn to any of these to note the astonishing progress made in marine engineering and ocean transport generally. Among famous lines the White Star Line holds a unique position, and exemplifies the finest traditions of British shipping. It is perhaps not generally known that the flag which now floats over the thirty odd steamers forming the fleet of the White Star Line is the same that once flew from the mast-heads of a fleet of sailing clippers years before the introduction of steam as the motive agent in the mercantile marine. The origin of the White Star really dates from the epoch of the great rush to the gold diggings in Australia, some sixty years ago, when in a period of about seven years over half a million adventurers were said to have been transported to the goldfields.



The "Bluejacket," First White Star Sailing Vessel

An important change occurred in 1867, when the managing owner of the White Star Line retired, and the flag was taken over by Mr. Thomas Henry Ismay, who began by introducing iron sailing ships in place of the wooden clippers formerly employed. One of these ships was called the "Bluejacket." Next came the greatest event in the history of the White Star flag—namely, the establishment in 1869 of the Oceanic Steam Navigation Co., Ltd. This was accomplished by Mr. Ismay, who, in 1870, was joined in the management by Mr. G. Hamilton Fletcher and Mr. William Imrie, of the late firm of Imrie, Tomlinson & Co., and in whose office Mr. Ismay and Mr. Imrie had been fellow apprentices. The title of the firm then was altered to Ismay, Imrie & Co. Mr. Ismay had already gained some experience with steamships as director of the National Line, which was established in 1863, in Liverpool, with three steamers called the "Louisiana" (later named the "Holland"), "Virginia" and "Pennsylvania." It is interesting here to recall the fact that the National Steamship Co. had the honour to be the first to introduce compound engines in the Atlantic trade, the "Holland" having had the original engines, with two cylinders, each 55 in. diameter and 3 ft. stroke, removed in 1869, and replaced by compound engines built by J. Jack & Co., of Liverpool.

Mr. Ismay conceived the idea of establishing a really high-class service of passenger ships to serve the Transatlantic trade, and an order, with a free hand, was given to Messrs. Harland & Wolff, of Belfast, to build a new fleet, the first of which was the "Oceanic," launched in August, 1870. This vessel made her appearance in the Mersey in February, 1871. Her chief dimensions were: Length, 420 ft.; breadth, 41 ft.; depth, 31 ft.; and tonnage, 3,707. The

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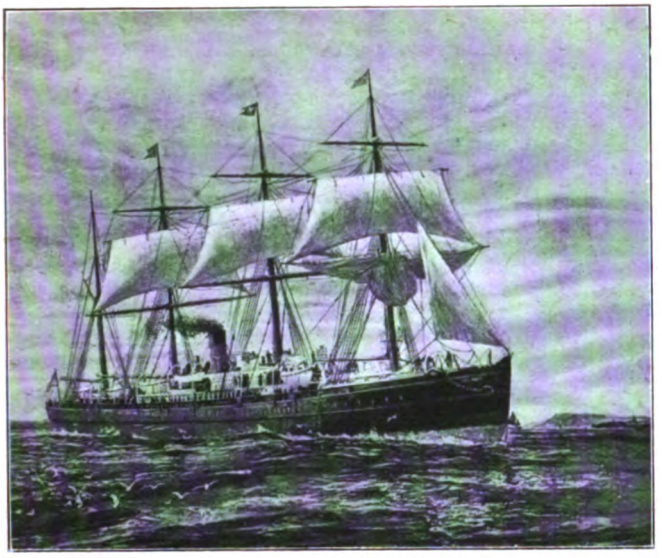

First "Oceanic," built 1871

"Oceanic" at one step quite eclipsed any vessel previously seen in the Mersey, and can be considered the pioneer of improvements which have since made travelling across the Atlantic a luxury. The builders put aside to a large extent the hitherto accepted ideas of steamship design, and, instead of the usual high bulwarks and narrow wooden deck-houses, another iron deck was added with open railings for bulwarks. The saloon, too, was, for the first time, placed amidships, and extended over the entire width of the vessel. Forward and aft of the saloon the state-rooms were arranged along both sides, and as all the sidelights were of unusually large size, they gave a bright and airy appearance to the interior, which contrasted with the older ships, much to the latter's disadvantage. The motive mechanism consisted of two sets of tandem compound four-cylinder engines, with two high-pressure cylinders, each 41 in. diameter, and two low-pressure cylinders, each 78 in. diameter, working on two cranks, with a stroke of 5 ft. Each engine (forward and aft) formed a complete unit in itself, a feature of importance in case of breakdown. There were twelve boilers, with a total of twenty-four furnaces, and working at 65-lb. pressure per square inch. These consumed 65 tons of coal per day, and the speed of the ship was 14 knots.

When she was first laid down the "Oceanic" was intended for the Australian trade via the Suez Canal, which was just about to be opened, but this idea was abandoned and the vessel was put into the "Atlantic Ferry" service, where her regular running and high speed soon made her famous. According to Mr. Maginnis, in his interesting book "The Atlantic Ferry," the "Oceanic" first sailed for New York on March 2nd, 1871, but had to put in to Holyhead owing to serious heating of the main bearings and crank-pins. After a few days' delay she proceeded to New York, where she was visited by an immense number of people. When she had completed a few voyages the "Oceanic" returned to Belfast to have alterations made, amongst which were the shortening of the four masts, the addition of a whaleback at the forward end, and the increase of her steam-raising power by the addition of two boilers. The saloon accommodation was also improved. The vessel continued in the New York service, making trips from Queenstown to New York in 8½ days, until 1875, when she sailed from Liverpool for Hongkong via the Suez Canal, there to open with the first "Belgic" and "Gaelic" a service on the Pacific between that port, Yokohama, and San Francisco. She returned to Liverpool in 1879 to be brought up to date in respect of both passenger accommodation and machinery, and sailed again on March 16th, 1880, with new boilers and modified machinery, calling at Suez, Hongkong and Yokohama, and arrived at San Francisco on June 6th, thus enabling passengers to complete a circuit of the globe by reaching Liverpool again in 75 days from leaving, against 80 days taken up till then. On her sixty-second voyage in October, 1889, the "Oceanic" made what was at that time the fastest passage on record across the Pacific, crossing from Yokohama to San Francisco in 13 days 14 hours 4 minutes. The vessel remained in service until late in 1895.

It is a far cry from the first "Oceanic" to the present-day "Olympic" and "Titanic," and striking changes have taken place in the driving machinery and in the fitting up and furnishing of the vessels. All along the proprietors of the White Star Line have been foremost in introducing improvements and applying to their fleet contemporary developments in science and engineering. It is no surprise to find, therefore, that their vessels are now equipped with the Marconi system of wireless telegraphy. One of the early experiments made by the White Star Line deserves to be recalled, and that is the attempt to replace the oil lamps used on board ship by gas lighting. The gas was made from oil by an apparatus carried on board, which occupied about 1,600

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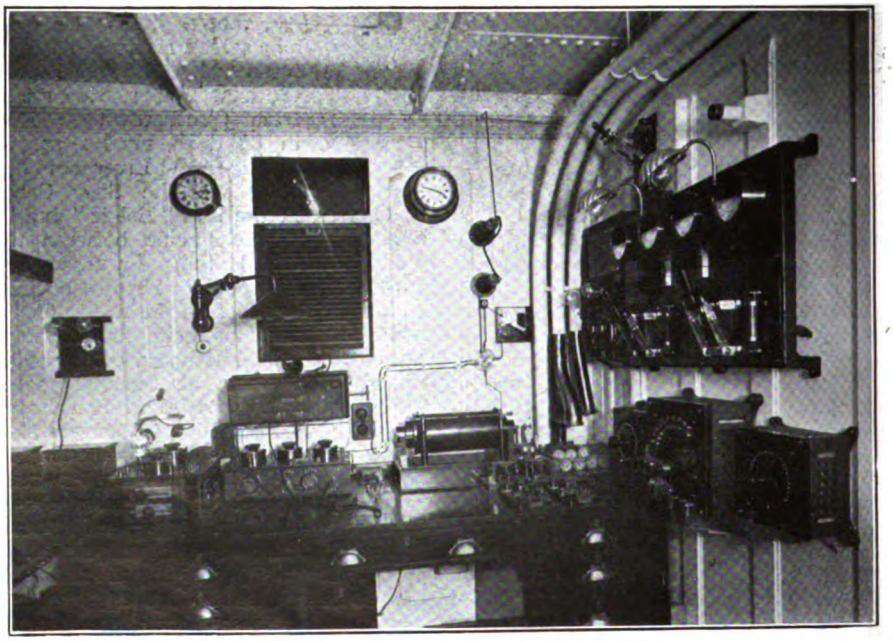
cubic feet of space. The first steamer so fitted was the "Adriatic," followed shortly afterwards by the "Celtic." Although the effect produced was a marked improvement, much trouble was caused by leaky pipes, produced by the working of the ship at sea, and the system had to be abandoned. It is interesting to contrast this method of illumination with that now in vogue. A further experiment in the early seventies was made in the adoption of oscillating state-rooms and berths to counteract the motion in a sea-way, but, as in the case of the "Bessemer," this had also to be abandoned.

But we must not tarry over the early days of this famous line, and even the intervening years must be passed over, interesting though this period is as showing how the small fleets of well-equipped liners sailed with great success to America, Australia, the Far East, and elsewhere. Apart from the two leviathan steamships, the "Olympic" and "Titanic," the White Star fleet at present comprises some thirty vessels. Of these, the "Adriatic," twin screw, 25,000 tons; the "Oceanic," twin screw, 17,273 tons; the "Majestic," twin screw, 10,000 tons, and the "Teutonic," twin screw, 10,000 tons, are mail and passenger steamers engaged in the Southampton and Cherbourg-Queenstown-New York service, calling at Plymouth on the eastward passage. The "Baltic," twin screw, 23,876 tons; "Cedric," twin screw, 21,035 tons; the "Celtic," twin screw, 20,904 tons, and the "Arabic," twin screw, 15,801 tons, are engaged in the Liverpool-Queenstown-New York service. The "Cretic," twin screw, 13,507 tons; "Cymric," twin screw, 13,096 tons; "Canopic," twin screw, 12,096 tons, and "Romanic," twin screw, 11,394 tons, are engaged in the Liverpool-Queenstown-Boston-New York-Boston Mediterranean service. All the above-mentioned boats carry mails and passengers. Between Liverpool, Quebec, and Montreal the "Laurentic," triple screw, 14,900 tons, and the "Megantic," twin screw, 14,900 tons, are engaged.

Between Sydney, Australia and London the White Star Line has a fleet of five steamers in constant service. These are the "Afric," twin screw, 11,948 tons; "Persic," twin screw, 11,974 tons; "Suevic," twin screw, 12,531 tons; "Medic," twin screw, 11,914 tons, and the "Runic," twin screw, 12,482 tons. Between New Zealand and this country there are four twin-screw steamers engaged—namely, the "Delphic," 8,273 tons; "Athenic," 12,234 tons; "Corinthic," 12,231 tons, and the "Ionic," 12,232 tons; the three last-named being the largest vessels in the New Zealand trade. The company also owns three tenders, two for passengers, the "Magnetic," twin screw, 619 tons, and the "Gallic," 311 tons, while the "Pontic" is a baggage tender of 395 tons. There has, however, been recently added a training ship called the "Mersey," 1,829 tons, which is famous as being the first



Wireless Operator's Room on the "Olympic"

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First Class Lounge on the "Olympic"

sailing vessel to successfully carry a Marconi wireless equipment.

Owing to the ocean-carrying trade having been largely transferred in recent years from sailing vessels to steamers, and by reason of the lack of opportunities for training future officers on steamships, the White Star Line decided a few years ago to remedy the deficiency by offering to educate cadets as apprentices on board a first-class sailing vessel of a size suitable for boys to handle. Under the commander there is an efficient nautical and educational staff, by whom the cadets are carefully and regularly exercised and instructed. In addition to having their general education completed, the boys are taught the special subjects required to qualify them for their profession. To carry on this excellent scheme Messrs. Ismay, Imrie & Co. commissioned the Clyde-built clipper ship "Mersey." The "Mersey" is 271 ft. long by 39 ft. beam, and 1,829 tons gross register. She is fitted throughout with electric light, and trades to Australia, or such other parts of the world as circumstances render desirable. About sixty boys are carried, preference being given to those who have had preliminary training on the "Conway" and "Worcester." The Board of Trade has interested itself in the scheme, and has issued special regulations whereby cadets who have had four years' instruction on an approved training ship may sit for an examination for a certificate as second mate, and after obtaining this certificate, and serving in vessels satisfying certain requirements, may be allowed to sit for examination for certificates as first mate and master. The boys are divided into three watches of twenty, each being in charge of a cadet-captain chosen for his general fitness. These cadet-captains, for the purpose of cultivating discipline, live in a separate room. After obtaining their second-mate's certificates the cadets will have the preference for appointments as junior officers in the steamers of the White Star, Leyland, Dominion and Atlantic Transport Lines. In addition to undergoing a course of studies suitable to their calling, the cadets work the ship. Although carrying cargo, and worked in a thorough-going manner as a trader, the primary purpose of the owners is the patriotic one of training British officers for the British mercantile marine. The "Mersey" recently completed her second voyage as a training ship, when she arrived in London on May 30th last. An account of this voyage and of the working of the wireless set appeared in the August issue of THE MARCONIGRAPH.

Little need be said at present of the "Titanic" and the "Olympic," the two largest vessels ever built, and the former not yet complete. Both of these vessels will be equipped with the Marconi system of wireless telegraphy. Passing in review the various vessels which form the White Star fleet, a good idea can be formed of the remarkable strides which have been made not only in marine engineering during less than half a century, but also of the magnitude of the organisation which is necessary to maintain the numerous services efficiently and profitably from the owners' point of view. The public are largely indebted to the White Star Line for many improvements in the means provided for ocean travelling. Amongst these may be mentioned: Improved proportions of ships; the placing of the saloon and passenger accommodation amidships; self-acting watertight doors; improved sub-division of the hulls by bulkheads; and wireless telegraphy.

No reference to the vessels of the White Star Line would be complete without recalling the part they play in the protection of their country. It is owing mainly to Mr. Ismay that the British Navy is able, in case of war, to call upon the services of the fastest vessels in the mercantile marine. It was at the time of the Russo-Turkish war, when there seemed some danger of this country being involved, that he offered to put several liners at the disposal of the Government. The idea was considered so excellent that in later ships special arrangements have been made so that they may, in case of need, be quickly converted into high-speed cruisers.

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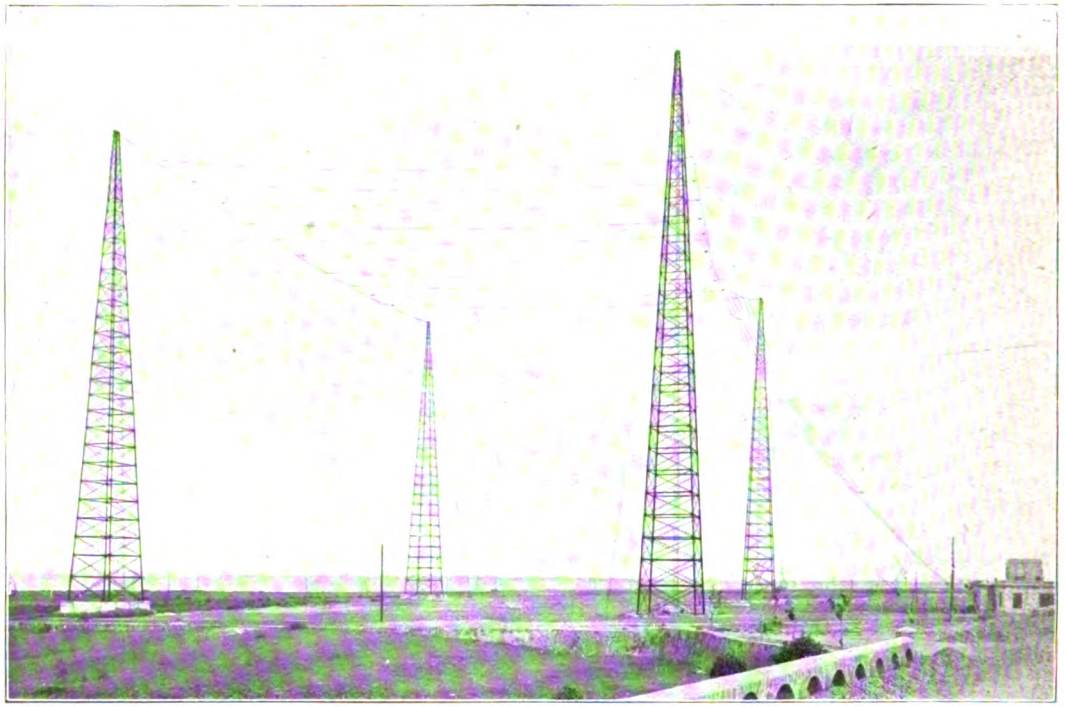
Marconi Station at Cadiz

THE wireless station which has recently been completed at Cadiz for the Compañia Nacional de Telegrafia sin Hilos, forms one of a group intended to connect the Canary Islands and the more important Spanish coast towns with the capital. The problem confronting the engineers responsible for the installation of the Cadiz, Tenerife, and Las Palmas stations, was by no means a straightforward one. These stations were originally commenced by the Compagnie Française de Telegraphie Sans Fil (Papp system) for the Compañia Concesionaria del Servicio Publico Español de Telegrafia sin Hilos. The affairs of these companies had, however, to be wound up, satisfactory working of the stations never having been effected. The Marconi Company agreed to take over their concession, and the Compañia Nacional de Telegrafia sin Hilos was formed.



The Marconi Wireless Station at Cadiz.

From motives of economy, therefore, it was necessary at the outset to decide what part of the existing plant could be utilised, and specially to design apparatus, in accordance with the latest Marconi practice, to be used in conjunction therewith. The original power plant was retained. It consists of a 46 horse-power engine, which drives, by means of a belt, a direct-coupled motor generator. A battery of accumulators having a capacity of 1,000 ampère-hours is provided. This is capable of running the station for several hours in the event of a breakdown in the prime mover.

The power taken from the alternator is 20 kw. The discharger, which is of the rotating disc type with radial studs, is driven by a separate motor. The Glace Bay pattern of high tension signalling switch is employed, a powerful blast of air being used to quench the arc at the contacts. The original condenser has been retained. This consists of a bank of Moscicki tubes, arranged vertically. The jigger, which is of a modified Clifden type, together with the necessary connections and 'bus-bars,

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is arranged as a superstructure. The capacity employed is half a microparad.

The wave length at present in use is over 7,500 ft., 250 microhenries of inductance being required in series with the aerial. The latter is provided for by three drums wound with "sea-serpent" cable, as also is the jigger secondary.

The aerial is of the "L" type, and consists of 15 wires supported by four steel lattice towers 75 metres in height.

Communication between Cadiz and the Canary Islands has proved to be good at all times. Good communication has also been established with the Barcelona station and with the Spanish military station in Madrid. Information is, moreover, to hand from the Eiffel Tower station to the effect that signals from Cadiz are very strong in Paris.

Reception is provided for by means of valve receivers with intermediate circuits.

In addition to the above-mentioned plant, a standard 3-kw. set has been installed for ship communication. A separate aerial is provided for this purpose, reception being effected by magnetic detector and multiple tuner.

In order to comply with the concession, a coherer receiver and Morse inker have been included.

Although, up to the time of writing, the station has not been opened for public service, ample evidence has been forthcoming that the amount of ship traffic will be very considerable. The geographical position of Cadiz is such as to render communication possible with most vessels following the Mediterranean, South African, and South American routes. The station has already proved of some service to the Spanish naval authorities.

A Chance for Dorset Men.

IN the present era of marvellous scientific advance, when the air is being conquered in more ways than one and pressed into the service of man, the wireless aerogram is quickly taking its place alongside the wire-sped telegram. The "Cecil" medal and prize, awarded annually by the trustees in connection with the Dorset Field Club, subserves a valuable purpose in the stimulus of scientific studies among the young men of the county. For the year 1911-12 the medal and prize will be awarded for the best paper on "The Most Recent Discoveries in Wireless Telegraphy and their Practical Advantages in Commerce and War." The competition will be open to any person who is between the ages of 18 and 35 on May 2nd, 1911 (that being the date of the last annual meeting of the club), and who either was born in Dorset or had resided in the county the previous twelve months. Papers for both medals must be written clearly or typewritten, and may be illustrated by drawings or photographs, provided that these are the personal work of the candidate. The committee attach great importance to original observation. There is no limit as to the length of the papers. Papers must be sent by March 1st to Mr. N. M. Richardson, of Montevideo, near Weymouth. Fuller particulars may be obtained from Mr. H. Pouncy, of the *Dorset County Chronicle* Office, the assistant secretary of the Dorset Field Club.

International Telegraph Monument in Berne

TWO years ago the graceful and original International Postal Union Monument was unveiled in Berne. It was the work of the French sculptor, M. René de Saint-Marceau, and was the design selected out of a number sent in by invitation of the Swiss Federal Council on behalf of the Governments represented in the Postal Union.

Last month the jury met in Berne to decide upon the most suitable out of about a hundred designs submitted for the new International Telegraph Union Monument, which it is now proposed to erect in Berne, on the Helvetia-platz. They chose one by Signor Giuseppe Romagnoli, of Bologna, of a statue representing Helvetia, seated, with figures on either side symbolising Trade, Commerce, Labour, and the Professions. The decision that the Telegraph Union as well as the Postal Union should have an international monument was taken at the Lisbon Telegraph Congress of 1908. The Swiss Federal Council, at the request of the Telegraph Union, have already once invited sculptors to send in designs for the new monument, but when the jury met to make a selection they did not approve of any of those submitted. The sum of 20,000 francs is to be awarded in prizes to the sculptors producing the best designs, while the sculptor entrusted with the carrying out of the monument will receive a sum of £2,800.

A Paris journal refers to the hobbies which occupy the attention of Kings in their leisure hours. It is interesting to note that King Albert of Belgium, alone among European monarchs, devotes his leisure to mechanical engineering. King Albert also takes a deep interest in wireless telegraphy; and it is said that in his private laboratory at Laeken Palace, where he conducts experiments, he has a complete collection of wireless apparatus.

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Maritime Wireless Telegraphy

THE new turbine steamers "Riviera" and "Engadine," which the South-Eastern and Chatham Railway Co. are placing on their cross-Channel service, are in many respects similar to the vessels already running on the Dover-Calais and Folkestone-Boulogne routes. They are, however, somewhat larger, being 315 ft. in length, 41 ft. moulded breadth, and 24 ft. 6 in. in depth from the awning deck. They are further distinguished from those already at work in having an installation of water-tube boilers instead of the ordinary cylindrical type. The passenger accommodation is of the usual nature, and does not call for special mention. Owing to the large and increasing traffic carried on by the company in shipping motor-cars for continental tours, special provision has been made on the new vessels for handling and stowing such vehicles. In addition to being provided with extra large hatchways to the holds, the steamers have been constructed with the after-ends of the main and awning decks specially strengthened for the carriage of motor-cars. The lifeboats are carried on the promenade deck, and can all be swung out in less than a minute. Indeed, as soon as the vessel leaves port it is the practice to swing the boats outboard until the destination is nearly reached. In this way the deck is left free from encumbrances, and the boats are ready for immediate lowering if required. Wireless telegraphy is fitted to each vessel. Further attention to safety is to be found in the shape of an installation of the Stone-Lloyd watertight door system, dividing the hull into four watertight compartments at a moment's notice. The vessels are fitted with a rudder at each end. The after rudder is of the balanced type, and has been specially designed by the builders for their turbine steamers. It is worked by a steam tiller controlled by telemotor gear from the flying bridge.

The propelling machinery comprises three Parsons turbines, each driving its own shaft and propeller. A set of six Babcock & Wilcox water-tube boilers provides the requisite steam generating power. A spare boiler has also been installed so that one boiler may always be off duty for cleaning.

On her trials the "Riviera" maintained a speed of 21·99 knots for four hours with only four out of the six boilers at work. With the turbines fully employed the highest mean speed on the mile was 23·07 knots. A speed of 15·15 knots was attained by the vessel when running astern, so that she is exceptionally powerful in this respect. The builders are William Denny and Brothers, of Dumbarton.

✦

Making her first trip across the Pacific from the Orient recently, equipped with wireless, the Osaka Shosen Kaisha steamer "Chicago Maru" was enabled to avoid a typhoon and considerable danger therefrom to her upper works. The wireless from the Japanese coast reported when the "Chicago Maru" was one day out that there was a typhoon raging to the north, and by altering her direct course slightly Captain Goto passed it to the south, and suffered only two days bad weather as a consequence.

✦

Messrs. Lamport & Holt have inaugurated their new express passenger service between England and South America by the sailing on her maiden voyage of the twelve thousand ton liner "Vandyck," with nearly three hundred passengers, most of whom were booked for Brazilian ports and for the vessel's final destination, Buenos Ayres. The "Vandyck" has been fitted up with most of the modern features of the great Atlantic liners, prominent among which is an installation for wireless telegraphy. It has been arranged to make Southampton a homeward port of call.

✦

The steamer "Aidan," an addition to the passenger fleet of the Booth Line, recently arrived in Liverpool. She is a ship of 4,544 tons, built for the Brazil service by the Tyne Iron Shipbuilding Co. The vessel starts with the advantage of having the Marconi wireless telegraphy apparatus on board.

✦

The following British vessels have been equipped with Marconi 1½-kw. sets and emergency plant during the past month: Steam yacht "Iolanda" (private owner), s.s. "Ballarat" (Peninsular & Oriental Co.), s.s. "Laconia" (The Cunard Steamship Co.), s.s. "Victorian" and s.s. "Armenian" (Frederick Leyland & Co.), s.s. "Mayaro" (The Trinidad Shipping & Trading Co.) and s.s. "Erinpura" (The British India Co.). The Marconi Co. have also received instructions to equip the following vessels for the Anchor Line Co.: s.s. "Circassia," s.s. "Castalia," s.s. "Columbia," s.s. "Caledonia" and s.s. "California."

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Personal

Mr. G. Marconi should have presided at the annual dinner of the Newsvendors' Benevolent and Provident Institution on November 27th, but he was out of England on that date, and consequently was unable to attend. He has contributed twenty-five guineas to the fund.

The presidential address which Mr. Marconi had arranged to deliver before the Junior Institution of Engineers on November 28th has been postponed until January 5th, 1912.

Mr. J. Henniker Heaton sails from England on a journey to Australia on December 1st, where he carries with him our best wishes.

Athletics

On Saturday, November 11th, about thirty members from the London office of Marconi's Wireless Telegraph Co., Ltd., visited Chelmsford, and were entertained by the works staff. In the afternoon a football match was played on the Recreation Ground, a good game resulting in a victory for the works by 2—0. High tea was subsequently provided at the Marconi Club, London Road, the company numbering about seventy. A smoking concert followed. Mr. C. Mitchell (works manager) presided, and was supported by Mr. Dowsett (chief of the test-room) and the following members of the staff from London: Mr. Bradfield (deputy-manager), Mr. A. Gray (chief of the engineering department), Messrs. Taylor, Hobbs, Cross and Withy. Mr. Dowsett extended a hearty welcome to the visitors; and Mr. Hobbs, in reply, invited the Chelmsford staff to London in January for the return match, and said they would be pleased to reciprocate their hospitality. Mr. P. Dumenil thanked the directors of the company for their generous financial support of the club, which, he said, was much appreciated. Mr. Bradfield distributed the following prizes: Walking race—1, A. Garner; 2, P. Dumenil; 3, H. Corfield. G. Royffe (scratch) was the fastest loser. Billiard handicap—1, Mr. C. Mitchell (who gave the prize for competition at the next handicap); 2, F. A. Hance. Highest break, A. Hazelton and S. Shawyer equal. During the evening a capital musical programme was contributed to by the following: Messrs. Rison, Cooper, Burden, Suckling, Herring, Hudson, Trueman, Smith, Meyer, Radke, Walsingham, Wilson, Fenning, Hewer, Fahie and Greenaway. Mr. Rison was the accompanist. The arrangements for the day were carried out by a committee, with Mr. C. Robarts as secretary.

Movements of Engineers

Mr. G. Vincent has returned to the Belgian Company at Brussels.

Mr. E. E. Triggs, having completed the removal of the Post Office Wireless Station at Crookhaven, has returned to London.

Messrs. A. B. Blinkhorn and H. E. Watterson have returned to London from Athens.

Mr. H. M. Burrowes has left Glace Bay and has joined the technical staff of the English Company, and Mr. F. H. Melville has taken his place at Glace Bay.

Mr. W. H. Venn is on his way back to England from Brazil.

Messrs. J. J. Leary, C. H. Keith, and R. H. Strickland are also returning to England from the Fiji Islands.

Mr. A. Dalgairns has gone to Broomfield Station for a course of instruction.

Mr. E. J. Watts has returned to London from the Cape.

Movements of Telegraphists

Mr. A. J. Osborn has been transferred from the "Baltic" to the "Corsican."

Mr. T. Gallivan has been transferred from the "Hildebrand" to the "Hilary."

Mr. H. Hayes has been transferred from the "Corsican" to the "Armadale Castle."

Mr. J. K. Lush has been transferred from the "Oravia" to the "Ascanius."

Mr. C. Searl has been transferred from the "Teutonic" to the "Atahualpa."

Mr. J. Durrant has been transferred from the "Mauretania" to the "Victorian" (Leyland).

Mr. T. J. Chapman has been transferred from the "Virginian" to the "Winifredian."

Mr. L. A. Dodds has been transferred from the "Ascanius" to the "Virginian."

Mr. C. J. Alsford has been transferred from the "Anselm" to the "Hildebrand."

Mr. A. F. Bruton has been transferred from the "Virginian" to the "Armenian."

Mr. A. W. O'Connor has been transferred from the "Grampian" to the "Dominion."

Mr. B. R. Stansfield has been transferred from the Marconi School to the "Devonian."

Mr. G. F. Pepper has been transferred from the Marconi School to the "Empress of Britain."

Mr. W. G. Sutherland has been transferred from the "Gloucestershire" to the "Leicestershire."

Mr. S. W. Brown has been transferred from the "Tunisian" to the "Grampian."

Mr. H. Sturdy has been transferred from the "Francis" to the "Oravia."

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THE MARCONIGRAPH

No. 10. January, 1912. Subscription, 3/- per annum, post free. Price 2d. Post Free 3d.

Wireless in South Africa

THE annual report of the Postmaster-General of the Union of South Africa makes a somewhat belated appearance. Nevertheless, it is of exceptional importance inasmuch as it deals with wireless developments in the Colony, and demonstrates the utility of these services. The report states that the radiotelegraph station opened at Durban on June 13th, 1910, has proved of much service to the shipping community and the travelling public. The station has a minimum sea range during the day of 250 miles; but at night, when signalling conditions are greatly improved, communications are frequently exchanged with vessels at a distance of over 1,000 miles. At the time of installation only three vessels trading in South African waters were able to exchange signals with the station. The provision of wireless facilities at Durban, however, has led to a remarkable increase in this respect, and there were at the time of the preparation of the report thirty vessels fitted with wireless apparatus trading with, or calling periodically at, South African ports. Other vessels are being similarly equipped. Owing to the electrical current from the local supply in Durban being cut off at certain times, it has been necessary to import plant to generate current for use by the station during such periods. This should be working early in 1912.

Tenders for the erection of a wireless telegraph station in the Cape Province were called for in June, and it was decided to accept that of Marconi's Wireless Telegraph Co., Ltd., for the erection of a 5-kilowatt station, with a guaranteed minimum sea range of 400 miles by day, and from 600 to 1,000 miles by night. Arrangements were also made with the Marconi Co. to send out an expert engineer to advise the Government in the selection of suitable sites for wireless stations. This gentleman arrived in the Colony on October 11th, and at once proceeded to inspect various points on the coast line of the Cape Province. As a result of his recommendations it was decided to erect the first station at Slangkop, in the Cape Peninsula. A suitable piece of land on Government property for a station was selected, and the erection of an operating house put in hand by the Public Works Department. The installation of the wireless plant was commenced under the direction of the Marconi engineer, who remained in the country to complete the station. The Slangkop station has since been under tests by officials of the Cape Town Post Office for the purpose of ascertaining whether it was capable of transmitting signals over the distance specified in the contract entered into by the Marconi Co. These tests proved satisfactory, and the station has been taken over by the postal authorities. It is stated that at present there are no vessels trading in South African waters with installations equal in power range to that at Slangkop; but reports show that signals from the station have travelled and been read without difficulty over the minimum distance by day—viz., 400 miles. Signals have also been exchanged at night with vessels from 1,000 to 1,500 miles distant, and it has been reported that on occasions signals from Slangkop have been received by vessels 2,000 miles away.

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MR. ADRIAN F. H. SIMPSON.

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Adrian F. H. Simpson,

Managing Director of the Russian Company of Wireless Telegraphy and Telephony

THE words used by Vallentine about Proteus, "His years but young; his experience old," may fittingly be applied to the subject of our sketch this month—one of the young but brilliant coterie of coadjutors which the outstanding genius and magnetic personality of Mr. Marconi have gathered with irresistible force round the throne of his mighty discoveries.

Adrian Simpson is a son of Surgeon-General Sir Benjamin Simpson, K.C.I.E., and was born in Edinburgh in 1880. His early years were passed amid the cultured and inspiring influences of his native city, whence he went to Clifton College and then to the Royal Military College. Apparently he was destined for a military career, and shortly after the outbreak of the South African War he gained a commission in the British Army, being gazetted to the 31st East Surrey Regiment, then stationed at Lucknow. After a short service with this regiment he joined the Hyderabad contingent of the Indian Army. This step marked the opening of a varied and interesting career, which brought Mr. Simpson in touch with life in several countries and considerably enlarged his experience in dealings with men and the handling of affairs. He served first of all in the Bengal, Bombay, and Madras Residences; afterwards he was placed in command of a detachment of native troops in charge of one of the large camps in which were housed the Boer prisoners captured in the South African War; later he served on plague duty in Central India. He went to Russia in 1903 in order to learn that difficult language, and so proficient did he become in this subject that in the examinations for interpretership in the Army he gained the highest possible degree. Moreover, he obtained Government awards for proficiency in Persian and Hindustani, and to the linguistic laurels which he gained, by sheer merit and ability, must be added a knowledge of French. Mr. Simpson spent two years in Russia, and during that time he travelled extensively, his travels taking him from the Arctic circle to the Persian frontier. Indeed, the all-pervading *wanderlust* of the modern Anglo-Saxon seems to have absorbed him, for at various times he travelled in Cashmir, Finland, Norway, Sweden, Denmark, India, Russia, and elsewhere. In 1904, when the Armenian troubles were prevalent in the Caucasus, he succeeded in safely carrying the "Foreign Office Bag" from St. Petersburg to Teheran. He also realised that there was oil in the Caucasus as there was balm in Gilead, and he accordingly spent some months with a party of English engineers prospecting for oil in those regions.

In Mr. Simpson's subsequent career we discern a peculiar trace of heredity in the combination of scientific and military practice, although in the case of our subject it was the scientific practice that was superimposed upon an edifice of military training and travel. Leaving the service in order to make a thorough study of wireless telegraphy, Mr. Simpson commenced work with the English De Forest Wireless Telegraph Syndicate, Ltd., and continued afterwards with the Amalgamated Radio-Telegraph Co., Ltd. (owning the Poulsen Patents). During his service with the last-named company he obtained an excellent opportunity, of which he took full advantage, of studying wireless telegraphy, not only as practised in England, but also on the Continent, where he spent considerable time in Berlin and Copenhagen, becoming subsequently associated with the Lepel Wireless Telegraph Co., Ltd. Mr. Simpson's connection with Marconi's Wireless Telegraph Co., Ltd., commenced with the Field Station Department, but on the formation of the Russian Company of Wireless Telegraphy and Telephony he was appointed managing director of that company. His unique experience, his commercial and technical attainments, his extensive travels, his linguistic ability, and, last, but by no means least, his knowledge of the language and people of that interesting country, encourage highest hopes for the success of his new enterprise, which all who know his kind and courtly nature, and his sound judgment and energy, are confident of seeing the happy realisation.

Mr. Simpson is an Associate Member of the Institution of Electrical Engineers and a member of the Anglo-Russian Chamber of Commerce. When a Royal Commission sat during 1910 to consider trade relations between Canada and the West Indies, Mr. Simpson gave evidence regarding the practicability of connecting the West Indian Islands by wireless instead of by cable.

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The Measurement of Condenser Losses.

By J. A. Fleming, D.Sc., F.R.S.

AN essential element in all apparatus for wireless telegraphy by electromagnetic waves is a condenser, and this appliance is required not only in the transmitting, but also in the receiving apparatus. In the transmitter the condenser is used to store up energy which is released periodically and expends itself in creating oscillations in the antenna, and therefore partly in radiated waves. At each release part of the energy accumulated in it is expended in heating the metallic circuit in which the condenser is inserted, another portion is dissipated in the spark-gap, a third in the condenser dielectric and plates, whilst of the remainder transmitted to the antenna, part is dissipated as heat in the antenna wire, some in the earth plate, and only a fraction sent out as energy of radiation.

As the energy dissipated in the condenser may be very considerable, it is desirable, therefore, to be able to measure it exactly, and to institute comparisons between different condensers in respect of their dissipative power. If we take precaution to prevent brush discharges, it is found that even then a not inconsiderable loss occurs in the dielectric. Some loss must exist in the metal plates, due to the current passing into and out of them at every oscillation. Experiment, however, shows that for condensers with air as dielectric the loss is very small provided that the metal plates are made of good conducting material with rounded edges and corners so that all brush discharges are prevented. A very useful type of air condenser for experimental purposes is one consisting of a number of fixed semicircular metal plates, one above the other, and a similar set attached to a rotating shaft so that the movable plates can be inserted more or less between the fixed ones and vary the capacity. Condensers of this kind with air as the dielectric, called variable air condensers, are very useful in the radiotelegraphic laboratory. By the aid of a couple of such condensers of suitable capacity we can make a determination of the energy loss in another condenser of a similar capacity, but with dielectric of some solid or liquid substance.

The necessary arrangements are as follows: An induction coil, I (see illustration), is excited with steady alternating current, and the secondary terminals are connected to a condenser, P C, spark-gap, S, and primary inductance coil, Pr. The condenser may consist of one or more Leyden jars, the inductance of a few turns of wire wound on a square wooden frame, and the spark-gap, S, must be an impact spark-gap, preferably of flat, closely-adjacent steel plates rotating in oil, as described in the author's British Specification (Fleming No. 23,242 of 1910).

At a distance from the above-mentioned primary coil, so as to be very loosely coupled with it, is placed a secondary coil of the same kind, consisting of a few turns of wire on a square wooden frame. This secondary circuit is completed by the condenser, C, under test, placed in series with another movable-plate air condenser, C_1, also a second movable-plate air condenser, C_2, is so arranged that it can be substituted for the condenser, C, under test. Two other appliances are inserted in the secondary circuit—viz., a hot wire thermo-electric ammeter, A, of the kind provided for the Fleming cymometer, which consists of one or more fine Constantan wires through which the current to be measured passes, and an iron-nickel thermojunction of fine wires which is soldered to one Constantan wire. This ammeter is calibrated by connecting the ends of the thermojunction to a low resistance Paul single pivot galvanometer, and measured direct currents from a storage cell are then passed through the Constantan wire and the deflections of the galvanometer noted.

This continuous current then gives us the root-mean-square value of any high-frequency current, , which, when passed through the Constantan wire, gives the same deflection on the galvanometer as the direct current. Likewise a sliding wire resistance, R, made of a pair of fine Constantan wires, is inserted in the circuit.

The condenser under test, C, may be considered to have its energy-dissipating power represented by a certain internal resistance which we will call r, which is in series with a capacity equal to the true condenser capacity. When the condenser is placed in an oscillation current, the time period of oscillation or frequency depends almost entirely on the true capacity, but the damping or decrement of the oscillations is affected by the resistance, r, of the condenser. The power factor of the

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condenser for a certain frequency, n, is very nearly given by the product, $2\pi nCr$.

Condensers with relatively large power factor are thus disadvantageous for use in wireless circuits compared with condensers of small power factor, because they create a relatively large decrement.

The process of measurement, then, is as follows. First, oscillations are set up in the primary circuit by means of the induction coil, and the secondary circuit is adjusted in such loose coupling that there are in it oscillations of only one frequency. It is advisable to use an impact discharger for this reason.

We then insert the condenser, C, in the secondary circuit and vary the capacity, C_2, and also that in the primary circuit until the two circuits are in tune and the frequency, n, has any desired value. Then observe the current, A, as read on the hot-wire ammeter.

Next substitute for the given condenser, C, the movable-plate air condenser, C_1, and vary its capacity until the current, A, has a maximum value. Also vary the sliding resistance, R, until the current has the same value it has when the condenser, C, is used.

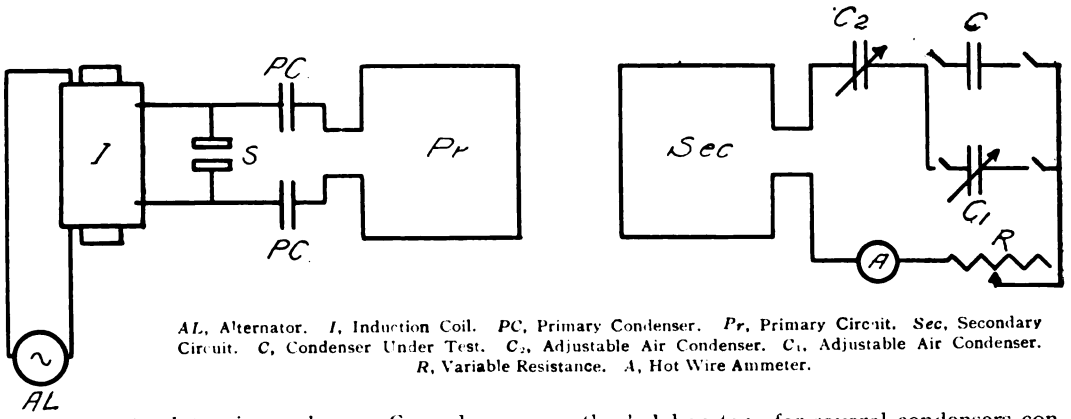
We have then substituted for the capacity of the condenser under test the equal capacity of a non-dissipative air condenser, and for the internal resistance or source of energy dissipation in the first condenser we have substituted an external resistance, R, and have the same current in the two cases and the same frequency. Hence the decrement must be the same.

Therefore the energy loss in the condenser, C, under test, is given by the value of A^2R where A^2 is the mean-square condenser current and R is the external resistance. Also the power factor is given by $2\pi nRC$ where C_1 is the equivalent air condenser capacity. The potential difference of the condenser terminals is given by 1000 $A/2\pi nC$, assuming the current to be measured in milliampères and the capacity in microfarads.

The chief difficulty which presents itself in this method is that of obtaining variable air condensers of sufficiently large capacity without undue bulk. On the other hand, if the plates of the air condensers are brought very near together the voltage which can be employed is necessarily low.

Moreover, if high voltages are employed, then brush discharges begin to appear at the edges of the plates, and we can no longer assume that the air condenser losses are negligible.

The above described method is, however, very suitable for measuring the loss in condensers intended for use in the receivers of wireless telegraphic apparatus, because the terminal voltages are then always low. Employing this method, the following measurements were made by Lieut.-Comm. S. Kurose in the author's laboratory for several condensers constructed with ebonite and glass dielectrics.



AL, Alternator. *I*, Induction Coil. *PC*, Primary Condenser. *Pr*, Primary Circuit. *Sec*, Secondary Circuit. *C*, Condenser Under Test. C_2, Adjustable Air Condenser. C_1, Adjustable Air Condenser. *R*, Variable Resistance. *A*, Hot Wire Ammeter.

Frequency used $=n$.	Capacity in mfds. of Condenser $=C$.	Current through Condenser in Milliamps. $=A$.	Equivalent Resistance of Condenser in ohms $=R$.	Condenser P.D. in Volts.	Power Factor
I.—Ebonite Plate Condenser.					
$0{\cdot}64\times10^6$	0·000865	44·3	3·35	12·9	0·012
	0·001650	59·5	1·60	9·0	0·011
	0·002495	55 0	1·22	5·5	0·012
	0·003760	71·0	0·85	4·7	0·013
	0·004230	68 0	0·65	4·0	0 011
	0·005323	72·0	0·50	3·4	0·011
$1{\cdot}48\times10^6$	0·000715	65·5	1·48	9·8	0·010
	0·001615	66·5	0·99	4·4	0·015
	0 002510	72·0	0·55	3·1	0 013
	0·002870	67 0	0 37	2·5	0·010
	0·003175	65·0	0·33	2·2	0·010
II.—Glass Plate Condenser.					
$1{\cdot}49\times10^6$	0·00046	66·5	1·28	15·4	0·005
$1{\cdot}90\times10^6$	0·00046	67·0	0·87	12·2	0·005
III.—Moscicki Condenser.					
$0{\cdot}64\times10^6$	0·00174	68·0	1·69	9·7	0·012
$0{\cdot}92\times10^6$	0·00174	68·0	1·52	6·8	0·015
$1{\cdot}43\times10^6$	0·00174	72·0	1·28	4·6	0·020

It will be seen, therefore, that in the case of the ebonite plate condenser the power factor

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is about 1·0 to 1·5 per cent., whereas in the glass-plate condenser used it was only 0·5 per cent., and in the Moscicki condenser rather more than 1·5 per cent.

The terminal-potential difference of the condensers used did not exceed a few volts, hence we cannot draw conclusions from these experiments as to the loss in transmitter condensers where the condenser P.D. is much higher. In this last case there is generally considerable energy loss due to brush discharges from the edges of the metal plates. This is to a large extent prevented by immersing the condenser plates in oil. Even then, unless the metal connectors are carefully designed, brush discharges may take place on the exposed portions.

It is for this reason desirable to employ air-condensers whenever possible, both in the receivers and in the transmitters of wireless telegraph apparatus.

In the case of transmitters the chief objection to the use of air condensers is their bulk, but this objection does not hold good for the receiver condensers. It must be remembered that as the energy picked up by the receiving antenna in any case is small, it is desirable to conserve it as much as possible, and if sharp tuning is desired to prevent by every possible means undue damping of the oscillations in the receiver's circuits. This is assisted by bestowing great attention upon the construction of the condensers, and selecting carefully the material used as the dielectric.

Wireless and Weather

THE next time a storm attacks the American shores the weather bureau at Washington will be ready and waiting for it. Wireless telegraphy is the means whereby the weather bureau is to keep its "eye" on the storms, the rains, and the fair weather that rise from the coast; and Atlanta, like other stations, will henceforth obtain advice by wireless of the kind of weather it is to expect.

News of this new effort by the weather bureau has been made public by the announcement from Washington, which was referred to in the December MARCONIGRAPH, that the Secretary of the Navy had directed some of the Government's wireless stations to keep in touch with all ships passing at sea for the purpose of getting information about the weather off shore. This news will then go by telegraph to the inland stations. Frequently it has been proposed that the Government should build observatories on islands off the coast for the purpose of keeping informed of the condition of weather at sea. But wireless telegraphy has superseded this idea. Conversations with passing ships seem to be an even better way.

The condition of the weather off the coast is an influence of utmost importance to weather conditions ashore. But hitherto it has been an element largely mysterious, with which the forecasters have reckoned principally by shrewd guessing. Often a dangerous storm arises there, and sweeps in to the coast before the weather bureau knows what is the matter. This is what happened at Charleston recently. But now the bureau believes it will be able to tell how the weather goes at sea, and what is to be expected on land. When throwing a "Good morning" to passing ships, the wireless stations will always add, "How's the weather?"

By more accurate forecasts of heavy rains, cold waves, or storms from the sea, the bureau believes it will be able to save many thousands of dollars to farmers, manufacturers, and other investors.

Long-distance communication in wireless telegraphy has been established at Mare Island, U.S.A., where the new high-power station carried on communications with Unalaska, 2,030 miles to the north. While communication at this distance has been possible before in the night, it is longer than any ever recorded in the daytime.

The wireless experts at Mare Island have been trying daily to establish new long-distance records since the new high-power plant was installed. The poles, which are 300 ft. high, are 400 ft. apart, and all the apparatus is especially constructed for clear talk over long distances.

The naval station at Unalaska was recently damaged by a terrific wind.

The Turco-Italian War; A Dramatic Incident

ON October 15th last, at 6 p.m. local time, the Marconi engineer at the Athens station happened to be standing by and listening on the magnetic detector, when he heard the following message come through in English:

"To Derna, Derna, Derna; leave the station. In ten minutes we shall destroy it.—ITALIAN ADMIRAL."

The message was repeated three times, after which there was silence.

Derna, on the Tripoli coast, is about 320 miles S.S.W. of Athens.

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Telegraphic Communications in Spain

Notable Success of Marconi Stations

NOVEMBER 28th, 1911, should prove to be a red-letter day in the history of Spain, which then became one of the most important of European countries in regard to the transmission of messages by wireless telegraphy. On that day were opened four of the largest stations which Marconi's Wireless Telegraph Co., Ltd., erected and equipped in Spain on behalf of the Compañia Nacional de Telegrafia sin Hilos. Various references to this great undertaking have appeared in previous issues of THE MARCONIGRAPH, and the newspapers all over the world have during the past few days spoken in unmeasured terms of praise of the unqualified success of the work. It is therefore opportune to describe more fully the stations that have been opened, and the important services which they will render.

The first four stations—namely, those at Cadiz, Teneriffe, Las Palmas, and Barcelona—were actually completed at the end of last July, but until they had been inspected and very thoroughly tested by the Spanish Government Commission they could not be opened for public service.

The first station visited was Cadiz, and after preliminary inspection of this station the Commission, accompanied by the representative of the Marconi Wireless Telegraph Co. and the chief engineer of the Compañia Nacional de Telegrafia sin Hilos, left for Teneriffe. Here a further preliminary inspection was made, and the Commission proceeded to Las Palmas to carry out the full inspection of that station. Further exhaustive tests were conducted during twenty-four hours between Las Palmas and Cadiz and Teneriffe and with ships at sea, and Senor Camino, the head of the Commission, expressed himself as astonished not only with the reliability of the service, but also with the speed and ease with which communication was carried out.

After the inspection of the Las Palmas station, two members of the Commission were left at Las Palmas, and two proceeded to Teneriffe, where another exhaustive inspection and continuous series of tests, lasting many days, were carried out. Communication was effected throughout day and night, and at no time was there any interruption of the service, although, as is well known, atmospherics become more troublesome the nearer the station is erected to the equator. After the inspection of these two stations, one member of the Commission was left at Las Palmas, one at Teneriffe, and the two senior members proceeded to Cadiz, where further exhaustive tests were carried out, messages being sent between the various members of the Commission at the different stations every hour of the day. On one occasion there was a short delay of an hour in getting a message through, due to an exceptionally violent thunderstorm, but at the same time cable communication was interrupted for ten hours owing to the same cause. The Commission expressed themselves as extremely satisfied with these three stations in every detail. They then proceeded to Barcelona, where further trials were carried out, communication being established with the utmost ease between Cadiz and Barcelona, which is a greater range than the company contracted that the stations should be capable of working over.

It will perhaps be of interest to describe each of these stations which have now been opened in more detail. Taking Cadiz first. This station is situated at the side of a road about 4 kilometres from the town of Cadiz, and about 100 yds. from the sea. The station consists of a large stone building provided with ample accommodation for the power plant, and also for the staff. It was originally erected by a French company, who put up the building and the four towers, and also installed their wireless system; but they were unable to establish communication between Cadiz and the Canary Islands, and the problem for the Marconi company was to utilise as much of the power plant as possible, and replace the French company's wireless apparatus with Marconi wireless apparatus.

It will be readily understood that it is easier to design a completely new station to communicate over the long distances required than to utilise the existing conditions and alter the wireless design to conform with the details already established. In the case of the Cadiz, as in the Teneriffe and Las Palmas stations, there are four towers placed in approximately a square of 90 metres, these towers being 238 ft. high, supporting an aerial of 15 wires, the engine-room plant consisting of an engine driving by means of a belt a dynamo direct-coupled to an alternator. The direct-current

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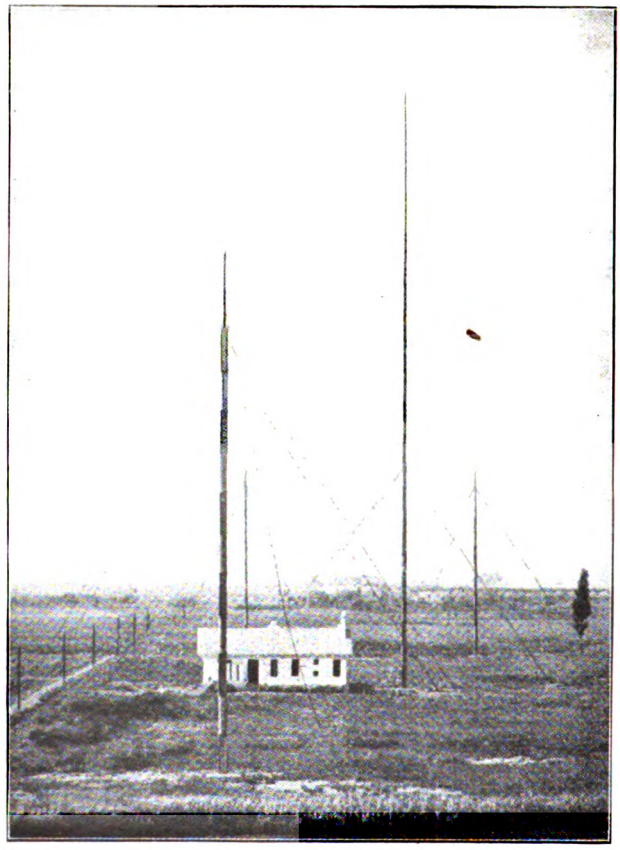
machine serves as a dynamo to charge a large battery of accumulators. It also serves as a motor, taking its current from the accumulators to drive the alternator supplying power to the wireless plant. The alternator is of 25-kw. capacity, 150 cycles, and 1,000 r.p.m., the voltage being 350/400. The station is supplied with a disc driven by a separate motor, and a speed of 800 r.p.m., and gives a note of about 320. The wave length of the station is 2,540 metres. The receivers supplied to this station are of the valve type for the long-distance communication, and a magnetic detector is supplied for communication with ships on the short wave. This station is also supplied with a separate 3-kw. plant for communicating with ships on the 600 and 300 metre wave length.

Cadiz is an old-world town, with many traces of the Moorish occupation. The climate is equable, and except for the disagreeable winds that blow there at times, the place is a pleasant one to live in. The facilities for the staff of the station are very good. The living quarters are comfortable, and as the trams pass the door of the station the staff are not in any way isolated.

It is worthy of mention that the Cadiz station has been in direct communication with Poldhu, and messages of a congratulatory nature were despatched by the Inspecting Commission to the head offices of the Marconi Wireless Telegraph Co., Ltd., in London, *via* Poldhu.

Las Palmas station is situated on the south-east corner of the island of Grand Canary, about 17 miles from the town of Las Palmas. The building is of a more imposing character than at the other stations. The situation of the station is at Point Melenara, on the rocks. This building is of stone and ferro-concrete, and the living quarters for the staff are very commodious. There are two storeys, the upper having a separate entrance, and comprising the living quarters of the operators. In the lower storey the power plant and wireless equipment are situated, and also the living quarters of the engineer-in-charge. The station, in other respects, is similar to that at Cadiz.



The Barcelona Station (*Prat de Llobregat*).

Teneriffe station is erected in the town of Santa Cruz, on the island of Teneriffe. The site of this station, as in the case of Cadiz and Las Palmas, was designed by the previous contracting company, by whom also the towers were erected. At this station great difficulty was experienced in obtaining a satisfactory earth, as the whole of the site consisted of lava, the island being of volcanic origin. The difficulty was overcome, however, by sinking a long trench 150 metres long and 2 metres deep, and burying galvanised iron plates to which the connections were made by means of radial wires. The power for this station is obtained from the power station of the town of Santa Cruz, and is used for driving a motor direct-coupled to an alternator. In addition to this source of supply, an oil engine has also been installed for the purpose of having an alternative source of supply in the event of an accident occurring in the power-house of the town, or on the line between the town power station and the wireless station.

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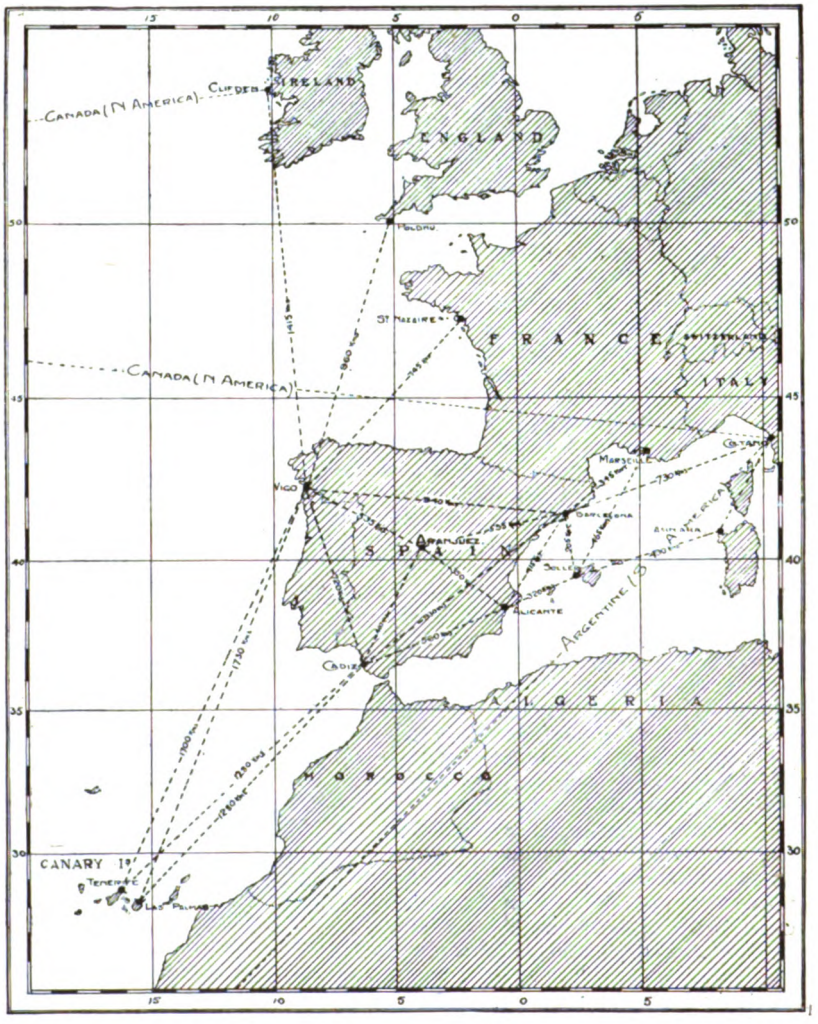
Santa Cruz is a delightful spot for those fortunate enough to obtain their living there. As is well known, it is the resort of many tourists who wish to avoid the rigours of the English winter. Mountains surround the town, and these are really extinct volcanoes. The trouble encountered here is lack of rain. At the time of leaving the island no rain had fallen for nine months, and the difficulty of obtaining an effective earth can easily be imagined.

Considerable difficulty was experienced in finding a suitable site for the erection of the Barcelona station. According to the conditions of the contract, the station was to be in the town itself, but no suitable land could be found at a reasonable price. It was necessary, therefore, to go outside the boundaries of the town and obtain permission from the Spanish Government for the site selected. A suitable site was found in the village of Prat de Llobregat, about eight miles outside Barcelona. The River Llobregat forms a delta on the south side of Barcelona, on two sides by high mountains, and on the other side by the sea. This delta is under very high cultivation, filled with orange, fruit and vegetable farms. The roads are not worthy of the name, and at certain seasons of the year the river overflows its banks and the whole of the delta is under water. For this reason the buildings are erected on arches, the lowest rooms being above the highest level to which any flood has yet risen. The building for the wireless station is also erected on this principle, and has a rather attractive appearance. This building is constructed of brick and iron, with a tiled roof, and is of two storeys, bedrooms and bathroom being on the upper storey, and engine and power-house on the ground storey.

This station is provided with five masts, the centre mast 280 ft. high, and four outside masts 130 ft. in height, the aerial being of the "T" type, six wires on each arm of the "T." There is also a separate aerial for the receiving, and another separate aerial for the communication on the short wave with ships. The station is provided with a heavy type oil engine, direct-coupled to a dynamo, with a battery of accumulators and a motor generator direct-coupled to the latest type of rotating disc discharger. The frequency of the generator is 150 cycles, and there are eight full-sized condensers in



Map showing the newly opened Spanish Stations, and the Coltano Station, and their connections.

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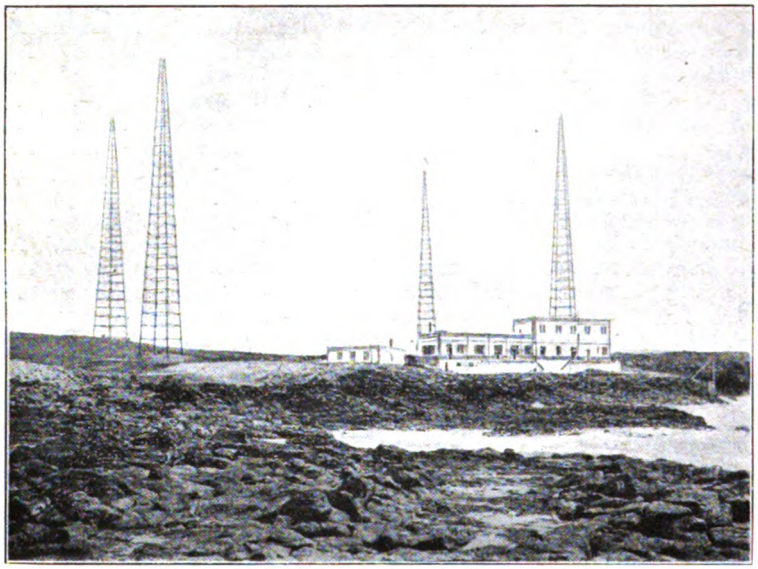
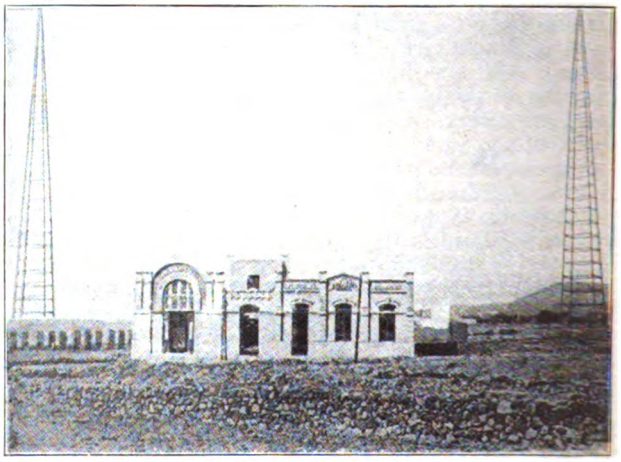
galvanised iron tanks for the long wave plant. The short-wave plant consists of four tanks, and obtains its power from the long-wave plant condenser circuit. The switchboards are fixed in the operating room, in which is also situated the receiving apparatus. Both valve and magnetic detector receivers are supplied. The masts are of the tubular sectional steel type, and set in blocks of concrete, the foundations of which had to be piled on account of the softness of the soil. The foundations for the buildings had in like manner to be piled. A large tank has been erected, 15 metres from the station, for a supply of fuel for the oil engine.



The Las Palmas Station.

The importance of the service which will be offered by these four stations cannot be over-estimated. The geographical position of Spain, commanding as it does the entrance to the Mediterranean, ensures that the stations on the Peninsula will obtain the bulk of the traffic passing in and out of the Mediterranean. The stations in the Canary Islands are on the main route to South Africa, Australia, and South America, and the fact that these stations can also communicate direct with Europe ensures that they will be utilised by the steamers plying on these great trade routes for communication to and from the rest of the world.

It now remains to describe the services for which these stations are intended. A glance at the map will at once show their importance for oceanic traffic between Europe and South America and South-West Africa. Barcelona will be in easy communication with the newly-opened station at Coltano, on the Gulf of Genoa, which is the largest in the world, and from which it is expected that messages can be sent to places upwards of 5,000 miles distant. The Cadiz station will communicate with the Canary Islands, with the central station also erected by this Company at Aranjuez, near Madrid (this station is now completed), with Barcelona and with ships at sea, and also with Vigo (the station at Vigo is also completed). The stations at Teneriffe and Las Palmas, in common with Cadiz, have a range of 1,600 kilometres, and will render service of primary importance to shipping. As is well known, the Canary Islands lie on the great routes to South Africa and South America, and a very large number of liners and freight vessels call at the ports in these islands. Besides the ships that call, there are other liners which pass the island without putting into port. On a voyage from South America, until these stations were



The Teneriffe Station.

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opened, ships did not come into communication with a wireless station on the Mediterranean route until they had passed the Spanish coast, and on the northern route until they got into communication at Ushant. With the Teneriffe and Las Palmas stations, ships coming from America, and also from South Africa, can get into communication about a week earlier than was the case before the Cadiz and Teneriffe and Las Palmas stations were opened.

In addition to the large number of messages that are likely to arise from the ships on this trade route, there will also be a considerable business between the Canary Islands branches of British and other European houses and their headquarters, and, of course, ships calling at the Canary Islands ports will readily wish to communicate with their agents in the island before reaching port.

Hitherto, ships on the South African route, after they had lost touch with Ushant, were out of all communication by wireless except through the medium of passing vessels, until they got into touch with the station at Cape Town—that is to say, after two or three days from home waters the ship was unable to communicate or know what was happening in the world until she was approaching Cape Town. With the establishment of these stations, however, a ship can have constant communication for nine or ten days on its outward voyage to the Cape. Those who have voyaged to the Cape will realise what it is to be without news for such a long period, and what a boon consequently the establishment of these stations will be. The Barcelona station is intended for communication between Barcelona and Marseilles, Balearic Islands, Italy, Aranjuez, and Vigo. On the tests carried out at Barcelona, communication was established between Barcelona, Vigo, Cadiz, and Coltano, in Italy. Barcelona is also open for communication with ships in the Mediterranean between the Italian coast and the coast of Spain. Here, also, the stations satisfy a great want, and it can be confidently relied upon that a very considerable amount of traffic will be handled at this station.

No mention has been made in this article of the interior and international traffic that will probably arise between the various towns where stations have been erected; but it is undeniable that these stations could compete very successfully against the existing system of telegraphy, both as regards rapidity of service and reliability. The four stations now opened are only part of the general wireless scheme for Spain. There are four others, either completed or in course of construction, in other parts of the country. These four are situated at Vigo, Aranjuez, Soller in the Balearic Islands, and Alicante. Three of these—namely, Aranjuez, Vigo, and Soller, are now completed, and the inspection of these stations by the Spanish Government Commission is to take place immediately. When these other stations are opened they will form the subject of another article on the Spanish undertaking.

The engineers in charge of the stations that have been completed—namely, Mr. Marden, Mr. Eisler, and Mr. Dobell, have carried out their work in a very satisfactory manner, which has resulted in convincing the Inspecting Commission of the Spanish Government that wireless telegraphy is a commercial success. Until the Commission had seen the working of the stations and the service that they were capable of performing, they did not believe that wireless telegraphy could offer anything but an unreliable service, and could not in any way compete in point of view of accuracy, speed, or reliability with the service given by a cable. We are glad to say that the opinion of the Commission has completely changed, and they have expressed their great satisfaction with the service rendered by the stations.

Notes from Greece

THE beginning of December saw the completion and handing over to His Hellenic Majesty's Government of the Athens Naval Wireless Telegraph station, an article on which appeared in the August issue of THE MARCONIGRAPH.

The official trials of the Athens station took place with the Greek cruiser "Spetsae." The actual distance over which the test messages were transmitted was 380 miles, the whole of the mountainous Peloponnesus peninsula intervening between the warship and the land station.

Lieut. Athanasiades, of the Greek Navy, has been relieved of the charge of the Athens station in order to write a book on wireless telegraphy for use as a manual of instruction for naval officers undergoing the "W.T." course at the Navy yard. Sub.-Lieut. Gonotas has temporarily been placed in charge of Athens station, vice Lieut. Athanasiades.

The Greek Government has entered into negotiations with the Marconi International Marine Communication Company with the object of sending a number of Greek naval petty officer telegraphists to England for the purpose of going through a course of instruction at the company's Liverpool school.

Vice-Admiral Lionel G. Tufnell, C.M.G., Naval Adviser to the Greek Government, reports that the eight torpedo boat destroyers recently equipped with the company's 1½ kw. sets are doing excellent work.

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From Official Sources

Legislation Recommended in the United States.

General James Allen, chief signal officer of the United States Army, draws attention in his annual report to the failure by the Senate to confirm the adherence of the United States to the Berlin Wireless Telegraph Convention, and the fact that it is only through courtesy or by some private arrangement that American ships can communicate with wireless stations in foreign countries. General Allen also refers to the great confusion that now exists in the transmission of wireless messages on the coast of the United States, seriously interfering with communication between various coast defences and ships at sea, and urges the necessity of legislation to provide adequate control of all wireless telegraph operations with special regulations for war conditions.

Indian Developments.

Several items of interest from a wireless point of view appear in the Administration Report of the Telegraph Department of the Government of India for last year, issued recently. For instance, we learn that the special surtax of four rupees per message on radiotelegrams exchanged between Calcutta and the pilot vessel at the Sandheads (the Sandheads is the pilot station at the mouth of the Hooghly, where all vessels proceeding up river to Calcutta take pilots aboard) was abolished, with effect from July 2nd, in favour of the usual rates for inland telegrams. This concession, granted by the Government of India in favour of wireless telegraphy was, doubtless, much appreciated by the people of India, especially the mercantile community of Calcutta, to which it must prove a great benefit. Then the Report states that a radiotelegraphic station having been opened at Bombay for the exchange of messages with ships at sea fitted with radiotelegraph apparatus, at first merely as an experiment, it was found that the system was so successful that it was decided to open this station as well as stations at Diamond Island, Sandheads, Table Island, and Victoria Point, for international wireless traffic. We are informed, however, that the radiotelegraph stations at Bassein (in Lower Burma), Mergui (a group of small islands lying just off the Tenasserim coast, at the extreme end of Tenasserim, where it connects with Siamese Malaya), and Port Blair (the chief station in the Andamans, India's great convict station), are not open at present for ship-to-shore communication, except in cases of distress. Further we learn that the most important event of the year (1910) in radiotelegraphy, was the placing of a contract with the Marconi Company for three stations with a range of 600 miles at Calcutta, Allahabad, and Delhi, and one station at Simla (Jutogh), with a range of 300 miles. Regarding the working of wireless stations in India, the Report says: "During the cold weather season, and at night, communication was effected over very long distances with the existing small power stations. The stations at Calcutta and Bombay were able to converse on two or three occasions. At Calcutta, the signals from the German cruiser 'Gneisenau,' on her voyage from Colombo to Bombay, were heard every night, and very frequently signals were heard from vessels voyaging between Colombo and Singapore. At the Sandheads it was reported that signals were received from Jask (Persian Gulf). The stations at Bassein and Diamond Island, in Burma, have, at times, read the signals from Bombay, while the latter station has sometimes heard the signals from his Majesty's ships in the neighbourhood of Hongkong. These phenomena, though interesting, are of no immediate practical value, and the extraordinary distances over which radiotelegraph signals can be read, has been observed at most radiotelegraph stations in both hemispheres."

Services and Charges in Spain.

His Majesty the King of Spain has, through the Minister of the Interior, authorised the creation of a new branch of the State Posts and Telegraphs Department under the title of "Radiotelegraphy." This department will be concerned with all matters appertaining to the wireless telegraphic services, and it is charged with the establishment of a school of wireless telegraphy in Spain.

An official order, dated November 24th, states that His Majesty the King has been pleased to command the opening of the wireless stations at Teneriffe, Las Palmas, Cadiz, and Barcelona, in accordance with the request of the Compañia Nacional de Telegrafia sin Hilos. The stations are further authorised to perform the following services of communication: (1) Communication from the land stations to ships at sea, and *vice versa*; (2) international service with foreign countries; (3) service between the Peninsula, Canary, and Balearic Islands, and *vice versa*; (4) interior service between the stations of the Peninsula. The

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taxes for the maritime service are as follows: The coast tax is 0.45 pesetas per word, with a minimum of ten words. The Spanish ship tax is 0.30 pesetas, with a minimum of ten words. The ordinary land line charge is to be added to every radiotelegram. The tax for foreign ships and countries is in accordance with their respective regulations and the Berne Bureau list. The rates between Spanish stations and foreign ships and countries are to be paid in francs. The rates for the other services will be published in due course.

King George and Wireless

WIRELESS telegraphy is truly making history. We recorded in our issue of last month the preparation of the *Court Circular* for the first time by means of wireless, and referred to the striking wireless communications which were maintained between King George and this country while the former was on his way to India on board H.M.S. "Medina." The continuous exchange of messages, many of them of great State importance, between the King and his ministers, and the King and other monarchs and foreign dignitaries, under the conditions mentioned, is not only remarkable testimony to the reliability of the Marconi system of wireless telegraphy, but is a proof of the confidence which this system has firmly established in the highest quarters, and it is a fitting compliment to the brilliant achievements which Mr. Marconi has won in other fields. The issue of a *Court Circular* from information telegraphed from mid-ocean, many thousands of miles away from the seat of publication, and recording events almost on the day following their occurrence, is an incident which, it would be reasonable to suppose, would occupy an unparalleled position on the pages of history for many a day. But wireless telegraphy does not stand with isolated victories to its credit. The marvel of one achievement had scarcely ceased to engage men's minds before another arose—one fraught with even greater significance. The newspapers on the morning of November 29th contained the announcement that "the King had been graciously pleased to offer a peerage to Sir Arthur Wilson. . . ." Behind the prosaic form of this announcement was something to kindle the imagination, and to charge the dry bones of Court formality with the romance of Mr. Marconi's great victory over Nature. King George was, at the time the announcement was made, somewhere midway between Aden and Bombay. What means, other than wireless, could His Majesty adopt to make known his gracious wish? This is probably the first occasion on which a peerage has been offered by wireless telegraphy, and certainly the first on which such an offer has been transmitted from Asia to Europe.

The King and Queen were very deeply interested in the working of the wireless installation on board the "Medina," and his Majesty tried his skill at sending a message, which reached the Admiralty headquarters at Whitehall almost perfectly.

It has transpired that the King, on board the "Medina," when between Aden and Bombay, was informed of the trend of Sir Edward Grey's historic speech in the House of Commons on the Morocco question by wireless telegraphy.

Progress in India

ON the night of November 29th, the newly opened Marconi station at Delhi, which was described together with other stations in India in the December issue of this journal, successfully transmitted the following msesage to H.M.S. "Defence" over a distance of 1,350 miles:

> "Marconi's Wireless Telegraph Co., Fort Delhi, humbly beg to offer His Majesty their most loyal greetings on his approach to India—transmitted direct from Delhi by wireless."

This is probably the first message to reach a British battleship direct from India.

The extension of wireless telegraphy in India is now to be carried out systematically. A route from Calcutta to Jutogh, Simla, by way of Allahabad and Delhi, was chosen in the first instance, and the installations are nearing completion. The next station to the north will be at Lahore, and this will be put in touch with Karachi. Later on Peshawar will doubtless be included in the system. In the west an installation is to be given to Bombay and another to Nagpur. Necessary funds will be provided during the course of this year.

The Johannesburg *Evening Chronicle* refers to the following interesting communications from Slangkop with certain vessels at 9 a.m. on November 24th, 1911, some of the distances covered being remarkably good:

615 miles, "Briton," N.W., outwards.
680 miles, "London," N.W., outwards.
990 miles, "German," N.W., outwards.
370 miles, "Dover Castle," N.W., inwards.

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Atmospherics in Southern Latitudes

BY C. A. OLIVER

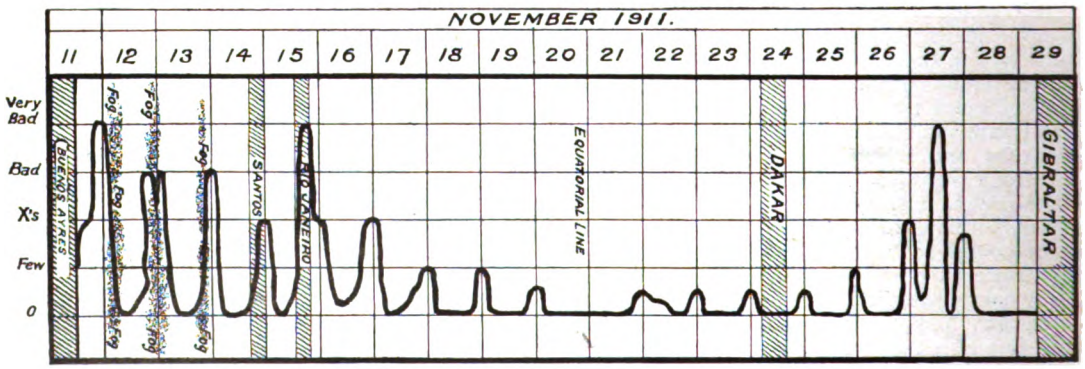
TO those interested in the solving of the atmospheric problem the accompanying graph will be of interest. It shows—as accurately as a small chart can show—the atmospheric trouble encountered during a voyage of the s.s. "Argentina" from Buenos Ayres to Gibraltar in November last.

During the greater part of the week prior to the departure of the vessel from Buenos Ayres, considerable trouble was experienced from "atmospherics," and it was impossible to work over other than very short distances. This is explained by the furious storms raging in the neighbourhood, which so charged the air with electricity that for the greater period atmospherics were quite continuous, and sparks could be obtained in the wireless cabin on board the "Argentina." The atmosphere cleared a little, however, when the vessel left the port. From 4 a.m. to 5 a.m., lasting sometimes till mid-day, there were practically no "X's." But even during these periods of calm the atmosphere seemed rather dense, and none but ordinary distances could be bridged. By the time Rio de Janeiro was reached the barometer had risen from 29·3 to 29·4.

From Rio de Janeiro to the equatorial line the ether became perceptibly clearer every day, and any "X's" that were encountered were generally weak, only interrupting fairly long-distance communications. By this time the barometer had risen to 29·5, and on the actual night of crossing the equator, though the atmosphere seemed "dense," there were no "X's" at all. On the way to the Canary Islands the ether was remarkably free from electrical disturbances, the one or two "X's" which occurred being mainly due to the lightning flashes of passing storms. The barometer rose to 29·6, but dropped a little during a storm encountered near the Canary Islands. This accounts for the graph line shown for November 27th. On the night before reaching Gibraltar there was no atmospheric trouble at all, this being the second perfectly clear night experienced during the voyage, but with this difference—that whereas on the first night the atmosphere seemed "dense," on the second it was distinctly clearer, and communication with other ships was possible over great distances. The signals from Ushant were specially noticeable.

The barometer reading while passing Gibraltar was 29·7.

A glance at the graph will show that the farther north the ship proceeded the better became the atmospheric conditions. The barometer rose from 29·3 to 29·7, which would seem to indicate that the atmospheric disturbances encountered in the southern latitudes were mainly due to local storms.



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The disappearance of a clergyman holding a Court appointment brought wireless into play in a manner which affords yet another example of its remarkable utility. Mr. R. H. Davis, a celebrated American author, was crossing the Atlantic in response to an urgent message from his sister. He little knew the reason for this call until one evening, when the vessel was out at sea, Mr. Davis received a wireless message from his brother intimating that the New York evening papers announced the cancellation of their brother-in-law's Court appointments in England. Then he understood why his sister had sent so urgent a message.

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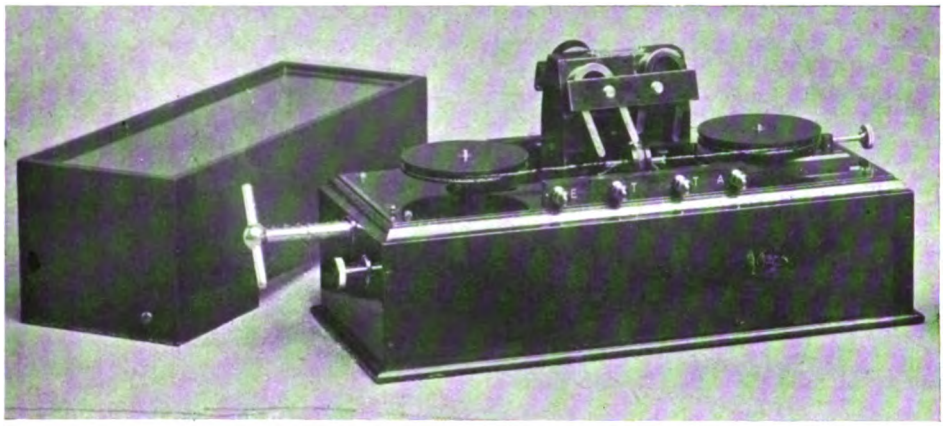
Some Marconi Instruments at the Physical Society Exhibition

THE Seventh Annual Exhibition of Electrical, Optical, and other Physical Apparatus, held under the auspices of the Physical Society of London, on December 19th, attracted an interesting collection of modern instruments. Messrs. Marconi's Wireless Telegraph Co., Ltd., had a stand which attracted considerable notice. The decremeter came in for a good deal of attention. The special function of this instrument is to measure the rate of decay of electrical oscillation amplitude in high-frequency circuits. The instrument also measures wave-length, coupling, capacity, self and mutual inductance. For both decrement and wave-length it is direct reading. A wavemeter was also shown. This comprises a simple oscillatory circuit, adjustable by means of a variable condenser, so that it may resonate to wave-lengths within a wide range. Resonance is indicated by a crystal detector and a double-head telephone. A table in the lid connects condenser reading with wave-length. A selective receiver, consisting of a complete set of three inductively connected circuits, each of which is adjustable, combined in one instrument with a sensitive oscillation valve detector and its potential regulating resistance attracted no little notice. Among detectors, the oscillation valve takes first place for combined sensitiveness, reliability and robustness. The multiple tuner may be described as an instrument used in the receiving circuit which, by means of three adjustable inductively connected circuits, applies the principles of resonance and coupling to strengthen the incoming electro-magnetic impulses of one desired wave-length, and to weaken the impulses of all other wave-lengths. It has a wide range, from 100 to 2,500 meters. The "Std. bi" arrangement of the instrument—which is obtained by a change-over switch—connects the aerial circuit direct to the detector circuit. It is then ready to respond to impulses of all wave-lengths. It is preferably used with the magnetic detector.

This well-known detector for electro-magnetic waves requires no adjustment, it is unaffected by moisture and temperature, and is proof against mechanical shocks which would render more sensitive detectors useless. The instructional buzzer shown has been devised for the purpose of training operators to read Morse by ear at the usual commercial speed, but at weak intensity of signals. The transmitting circuit consists of a dry cell, operating key, a silent buzzer, and induction coil. The receiving circuit consists of an inductive coil and a pair of head telephones. The coupling of the two coils can be adjusted from a maximum to nothing, and the strength of the telephone current varied accordingly.



Magnetic Detector.

Finally, mention should be made of the model of wooden and steel lattice masts which have now given place to hydraulic pressed-steel tubular masts. The model shown corresponded in every detail with the standard Marconi land station mast, reduced to one-sixth full size. The design permits of masts of any size being constructed with standard sections.

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THE MARCONIGRAPH

An Illustrated Magazine for all interested in WIRELESS TELEGRAPHY, published monthly by MARCONI'S WIRELESS TELEGRAPH COMPANY, LIMITED. Watergate House, York Buildings, Adelphi, London, W.C.

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The Editor will be pleased to receive contributions; and Illustrated Articles will be particularly welcomed. All such as are accepted will be paid for.

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The Share Market

The market in Marconi issues since our last issue has been a very active one, and has broadened out considerably, buyers coming forward from all parts of the globe.

The developments of Marconi wireless in Canada have brought the Canadian company's shares into favour, and many people who have made big profits out of the Marconi shares are now turning their attention to the Canadian issue.

Prices since our last issue of November 24th have risen considerably. On December 20th the following were the prices:

Marconi Ord. to 58s. 3d., after having been 59s.
Do. Pref., 2¼.
Do. New Shares, 18s. premium.
Canadian Marconi, 17s. 3d.
The market was looking very firm.

The International Bureau

A circular has been issued by the Bureau International de l'Union Télégraphique (Convention Radio-télégraphique Internationale) at Berne, intimating that the Dutch Government have applied through their Minister for a representative on behalf of the Dutch East Indies, and another on behalf of Curaçao, at the next Conference on Radio-Telegraphy, which meets in London in June, 1912.

Arrests by Wireless

A curious situation has arisen in German shipping circles over the demand of the Foreign Office to the effect that the steamship lines should instruct their captains to arrest on the high seas persons for whose apprehension a warrant has been issued, the notice to do so being received by wireless. All the companies, with one exception, have decided to comply with the request, but the company not complying, strengthened by the opinion of a well-known authority on international law, takes the view that a shipmaster is not an official of the Public Prosecutor's department, and has no power to detain a passenger, unless it be for an offence committed on board. It, therefore, refuses to instruct its captains in the manner indicated. No such procedure has so far been contemplated in this country. Shipmasters are always prepared to assist the authorities; and in the case of Crippen, it may be remembered, the actual arrest was made on board a steamer.

Imperial Wireless Telegraphy

Speaking at the fourteenth annual meeting of the British Empire League, Mr. Herbert Samuel (the Postmaster-General) referred to the question of communications as one of the greatest problems of the Empire, and said that it had been the invention of the electric telegraph which had done more than anything else to promote the growth of the Imperial unity which we had seen during our time. He said the Government were pressing forward a system of wireless telegraphy stations which would enable communication to be carried on between the United Kingdom, the Mediterranean, Africa, India, Australia and New Zealand. By that means they hoped to facilitate and cheapen communication along that Empire route.

News of the sudden eruption of Stromboli Volcano was first known at Catania Observatory as the result of a wireless message.

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The Patent Situation

PROCEEDINGS at law have been commenced in New Zealand by Marconi's Wireless Telegraph Co. Ltd., against Huddart Parker, Ltd., for infringement of the Company's patents by the use of the Telefunken system of wireless telegraphy on board some of their ships plying between Australia and New Zealand. Instructions have been cabled to commence similar proceedings in Australia against the same firm and the Australasian Wireless Co., who supplied the plant.

The Helsby Wireless Telegraph Co., Ltd., having applied for a licence to work under the extended patent granted to Sir Oliver Lodge, and now the property of the Marconi Co., the Board of Trade appointed Sir Cornelius Dalton, late Comptroller-General of Patents, as arbitrator. The hearing commenced on December 11th and is still proceeding.

Messrs. Siemens Brothers & Co., Ltd., the assignees in this country of the Telefunken system of wireless telegraphy, have also applied for a licence to work under this patent, and are assisting the Helsby Co. in the arbitration proceedings. It is contended on behalf of the applicants that they cannot work any system of wireless telegraphy without a licenec under the patent in question. The arbitrator has fixed tentatively January 22nd, if convenient to all parties, for the hearing to be resumed.

The Helsby Wireless Telegraph Co., Ltd., have installed the system on four of the ships of the London & North Western Railway Co., and the original application was for a licence for these four ships, but upon the submission of the blue prints of the actual installations, the Marconi Co. contended that their No. 7777 patent was infringed; the arbitrator is therefore asked to define the terms of a general licence, excluding these four ships, in respect of which other proceedings will be commenced.

The Marconi Co. are determined to protect their rights under their patents in all countries, and legal proceedings are pending in respect thereof in France, Spain, and the United States of America.

Great pains seem to have been taken to publish on the Continent, and in the Colonies, the fact that Marconi's Wireless Telegraph Co. have withdrawn an action commenced against Messrs. Siemens Brothers & Co. in respect of the Telefunken patents. Our readers will be interested to know what are the facts of the case.

On October 20th last the Marconi Co. issued a writ against Messrs. Siemens Brothers & Co. for infringement of their Patent No. 7777. On the following day it was determined to sue Messrs. Siemens in respect of infringement of another patent, and therefore a new writ was applied for, embracing both the four sevens patent and the other one. It being obviously useless to proceed with two actions for infringement of the same patent, the writ No. 1 was withdrawn, but the action for the infringement of the patent with which it dealt is continuing under the writ issued on October 21st.

The communication of such information to the Government of the Commonwealth of Australia was immediately followed by a report that the Commonwealth Government has discontinued the contract which it entered into for the erection of stations under the Telefunken system.

A Suggestion from Penarth

The following is the text of a letter which appeared in the *South Wales Daily News* on December 20th, from Mr. Richard Richards, of Broomfield Place, Penarth :

> " I am very pleased that the gallantry of the French sailors is to be recognised, and I hope the Marconi operator who intercepted the message from the stranded ' Delhi ' will not be forgotten. As one who some years ago watched the poles at the end of the beautiful cliff walk at Penarth with thoughts of some terrible engine of destruction being laid down, I think it is time that we do something to honour Marconi by placing a monument of some description there. The spot is singularly appropriate, overlooking the channel, where thousands of sailors of all nations—to whom it would also serve as a beacon—pass from the great ports of Cardiff, Newport, Bristol, etc. With the rescues all over the world so fresh in our memories, we should give honour to whom honour is due, lest we forget."

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Diary of Events.

[Under this heading we give a monthly record of the progress of Marconi wireless telegraphy. Apart from the general and historical interest which attaches to such a compilation, we have reason to believe, from the number of inquiries that constantly reach us, that it will be of much service to lecturers, tutors and others who may be professionally interested in the subject. Appended are some notable events that have occurred in January of preceding years.]

1899.

January 8th.—Mishap to East Goodwin Lightship reported to Trinity House by wireless telegraphy.

1901.

January 8th.—Wireless telegraphy experiments on "Princesse Clementine" carried out during storm, communication being maintained all the way from Ostend to Dover.

1902.

January 22nd.—Mr. Marconi sailed for America on s.s. "Philadelphia," and during the voyage he succeeded in receiving legible messages up to 1,551½ miles, and Morse signals up to 2,099 miles from Poldhu station.

1903.

January 10th.—Messages from President Roosevelt to King Edward were sent by wireless telegraphy from Cape Cod station through Poldhu station.

January 22nd.—The s.s. "St. Louis," which was not then fitted with wireless telegraphy, broke down. Passengers' committee, which was formed, expressed regret of absence of wireless, and shortly afterwards Marconi apparatus was installed on this vessel.

1905.

January 1st.—Messages for ships at sea were accepted at post offices throughout the United Kingdom.

January 17th.—Agreements entered into for the equipment of a number of the largest trans-Atlantic liners.

1908.

January 23rd.—Agreement made for supply of two portable military sets to the Siamese Government.

1909.

January 23rd.—The great services of wireless telegraphy to shipping demonstrated by a mishap to a great liner in mid-ocean. Communication between the vessel and the Marconi station at Siasconsett, and other vessels equipped with Marconi apparatus, which went to the assistance of the injured ship, with the result that the whole of the crew and passengers were saved.

1910.

January 25th.—Mr. Godfrey C. Isaacs appointed managing director of Marconi's Wireless Telegraph Co.

January 26th.—Orders received for the equipment of nine vessels belonging to the Allan Line.

Lectures

A lecture was given by Mr. G. Murfitt at St. Mark's College, Chelsea, S.W., on the commercial side of wireless telegraphy, on Saturday, November 25th, 1911. At the close of the meeting a hearty vote of thanks was passed to the Marconi Company for the loan of lantern slides, which were used to illustrate the lecture.

Mr. John McLaren delivered a lecture on "Wireless Telegraphy" before the Institute of Marine Engineers, London, on December 11th. He maintained that a study of this subject must claim the close attention of the marine engineer, as wireless telegraphy was now regarded as an essential part of the outfit of large passenger vessels trading to all parts of the world. Mr. McLaren drew attention to the advantages of using wireless telegraphy on board ship, and described the various types of Marconi apparatus now available.

Capt. H. Riall Sankey, a director of Marconi's Wireless Telegraph Co., Ltd., lectured before a crowded audience at the Beth Hamedrash and Jewish Institute on December 2nd on the subject of wireless telegraphy. Keen interest was displayed in the simple yet lucid explanation of the principles of wireless telegraphy, and in the clearly narrated history of its technical and commercial development. The lecture was illustrated by means of lantern slides, and some specimens of Marconi apparatus were exhibited. In proposing a vote of thanks to Capt. Sankey and to the directors of the Marconi Company, the chairman, the Rev. Dr. Feldman, dwelt upon the great services which Mr. Marconi's far-reaching discoveries had rendered to humanity in minimising the terrors of the ocean.

Powerful Swedish Station

Sven Hedin, Svante Arrhenius, and several well-known business men have petitioned the Swedish Government for a concession to build a wireless telegraph station, on the Marconi system, near Stockholm, with a power radius of 1,200 miles, which will permit a regular telegraphic connection between Sweden and several European and other countries, Canada, the United States, South America, Africa, Asia, Australasia, and with ships on the high seas. The connection with Great Britain would be direct, and with most other countries via Great Britain. A company will be formed with a share capital of £100,000. The station will be ready in a year.

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In Arctic Regions.

THE penetration of the Arctic circle by wireless telegraphy should make it possible for that ambiguous personality, "the man in the street," to realise the tremendous grip which Mr. Marconi's invention has effected upon the world at large. Reference was made in a recent number of this journal to the voyage of a United States revenue cutter, fitted with Marconi apparatus, to the Antarctic circle, from whose frontier communication was maintained with the mainland without any difficulty. The complete story of this great accomplishment will be told on some future occasion. In the meantime an interesting incident deserves to be recorded.

The P. and O. steam yacht "Vectis," fitted with Marconi wireless telegraphy, was inside the Arctic circle from Saturday, July 8th, 1911, until the following Wednesday. At 10 p.m. on the Sunday, when about eighty-six miles from her destination, Spitzbergen, the "Vectis" encountered a floating ice pack. After skirting this ice in a vain endeavour to find a passage through, the yacht was turned south and proceeded to Cape North. While crossing the circle, "Arcticus, King of the Regions of Ice," boarded the vessel and initiated the officers and passengers as subjects of his kingdom. The ceremony was very similar to that performed when "crossing the line," and caused much amusement. Each person thus initiated was awarded a certificate of freedom "from all limitations of the south." The wireless operator on board the yacht, Mr. A. Bagot, was thus initiated and received a certificate, of which we present an illustration on this page. Mr. Bagot is curious to know whether the "Vectis" was in the magic circle before the "Bean," and, if so, whether it may be credited with priority.

THE IMPERIAL AND ROYAL COURT

ON BOARD THE P.& O.S.N.Co S.S. "Vectis."

CERTIFICATE OF ARCTIC INITIATION.

We, ARCTICUS, Ruler of all Regions of Perpetual Snow and Ice, in the presence of Our most Noble Court this day assembled on board the s.s. "VECTIS," do hereby, of Our Royal and Imperial condescension, graciously grant our consent to the Arctic Initiation of Alec Bagot and make him free henceforth and for ever from all limitations of the Regions of the South; and grant Our Royal Warrant that he may bear the name of Marconi within the circle of Our SUPAEME DOMINIONS

GIVEN under Our hand and Seal this Eighth Day of the Seventh Month in the year of our Lord One Thousand Nine Hundred and Eleven.

Arcticus R.

From Siasconset Log Book.

NEARLY every week during the winter season the Marconi wireless station at Siasconset, U.S.A., reports to the Revenue Cutter wrecks of schooners. The number of messages of this kind handled at Siasconset would surprise the uninitiated. The following extract from the official log for November 17th gives some idea of the reports of wrecks of schooners received at Siasconset:

"8.30 a.m. RCU (Revenue Cutter 'Acushnet'), says going to Vineyard with schooner.

"Coskata reports crew of vessel on Great Point all lashed to rigging with seas breaking clear over them. Wants cutter's assistance, as they cannot get through the surf to them. Advise 'Acushnet.'

"9.1 a.m.—RCU says: 'We are towing schooner to nearest place of safety, and will return immediately to Great Point.'

"9.26 a.m.—DKS nil.

"9.47 a.m.—RCU nil. Tell RCU another schooner requires assistance at Pollock Rip.

"Coskata reports lifesavers have now reached schooner 'Charles Walston,' and are taking crew off."

The wireless telegraph mast at Westward Ho! for communicating with Lundy Island, which was blown down through the recent storm, has again been set up.

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Reviews of Books

"WIRES AND WIRELESS," by T. W. Corbin. (C. Arthur Pearson, Ltd., 17–18 Henrietta Street, London, W.C., 1s. net.)

As might be gathered from the title, this book is not devoted exclusively to wireless, but deals in a general way with the use of electric currents in telegraphy and telephony. It is neither a text-book for students nor a treatise for the scientist or practical man; the book simply presents a readable description of the various ways in which electricity is made to carry messages and the general principles of the appliances used. The first chapter deals appropriately with the "unseen messenger" that has made long-distance communications and signals possible, and after an explanation of the elementary principles of electricity the author, in succeeding chapters, tells us as much as is possible in the limited space at his disposal about telegraphs. The tenth chapter is devoted to wireless telegraphy. Only ten pages are given to an explanation of the principle upon which the system works, and anything in the nature of a detailed description of the apparatus used has been avoided. We have no fault to find with the account which the author has given of wireless, which, like the other sections of his book, will be found interesting and, indeed, instructive. We venture to predict, however, that the chief effect of the chapter on wireless will be to whet the reader's appetite and send him in quest of further information. The author claims that wireless is the oldest form of telegraphy, and in support of his assertion he takes us back to the days of the Spanish Armada, when "the red glare of Skiddaw roused the burghers of Carlisle." He considers that this was a species of wireless telegraphy which was in all essentials identical with the wireless telegraphy of to-day. It is possible to go even much farther back than this, however, to discover analogies.

It remains to be said that the illustrations and diagrams in the book, to the number of thirty-eight, are both helpful and interesting. The frontispiece shows a Marconi operator in his cabin on board ship listening to the sounds which spell out to him the messages which the ether waves are bringing from the distant shore or ship. Other illustrations are those of the long-distance Marconi station at Poldhu and the Marconi cabin on the s.s. "Minnetonka." Obviously the picture on the outside front cover has been inspired by the familiar picture which adorns the front cover of THE MARCONIGRAPH.

"THE 'MECHANICAL WORLD' ELECTRICAL POCKET BOOK." (Emmett & Co., Ltd., Manchester and London, 6d.)

The 1912 issue of "The *Mechanical World* Electrical Pocket Book" has been enlarged by the addition of sixteen pages, while considerable improvements have been effected in various sections of this popular handbook. Attention is directed to the fact that the matter devoted to lighting has been entirely rewritten and is now presented in two sections, one dealing with electric lamps and the other with electric lighting. A new section on motor starters has been introduced, also one on static transformers, and another on the construction, rating, and testing of high-tension apparatus. The new tables relate to aluminium cables, power factors, maximum currents for copper conductors, etc. The book in general has been thoroughly revised and many new illustrations introduced.

The book is one which can be recommended to telegraphists who are in charge of electrical plant or apparatus. It does not take up much room in the pocket, and has the further advantage of space for diary and memoranda.

"LA TÉLÉGRAPHIE SANS FIL APPLIQUÉ À LA MÉTÉOROLOGIE, AUX PRÉVISIONS DU TEMPS ET À L'ETUDE DE LA PHYSIQUE DU GLOBE," by A. Boutquin. (Brussels, Société Belge d'Astronomie.)

The importance of wireless telegraphy to meteorology is scarcely realised by the general public, if not by the very parties who benefit so considerably from the greater accuracy with which the combination has endowed weather forecasts. In a recent issue of THE MARCONIGRAPH we traced a development of the application of wireless telegraphy to meteorology, and showed how great was the benefit which the old science derived from the new. Dr. W. N. Shaw, the distinguished director of the Meteorological Department in London, and Dr. Polis, of Aix-la-Chapelle, have proved the advantage of being able to obtain by wireless particulars of important zones which they would otherwise be unable to make use of in their observations. M. Boutquin has also given considerable attention to this matter, and has produced an interesting brochure under the above title. M. Boutquin lays great stress upon the fact that wireless telegraphy now furnishes a means of calculating the value of the various influences that affect the science of meteorology. His brochure can be read with much interest and profit, whilst he is at the same time to be congratulated upon having collected such convincing evidence in support of a very great movement.

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MODERN ELECTRIC PRACTICE

Edited by
Prof. Magnus Maclean, M.A., D.Sc.

With Contributions by the following
THIRTY-EIGHT RECOGNISED AUTHORITIES

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Reed Tuning

BEING inundated with inquiries from members of the Stock Exchange and the public as to the Company's knowledge and information upon what is termed "Reed Tuning," Mr. Godfrey C. Isaacs, the Managing Director of Marconi's Wireless Telegraph Co., Ltd., found it necessary to make a public explanation of the position, in which the following statement occurred :

"The fundamental principle of all reed tuning is a receiver in which a mechanically vibrating part is tuned to the frequency of received electrical impulses. There is nothing new in this principle, for which we hold the master patents. Some years ago we gave the subject very careful and exhaustive study and consideration."

In a further communication on the subject, Mr. Isaacs adhered to the foregoing general statement which he declared he would maintain should occasion arise.

Some days ago a demonstration of the systems propounded by Messrs. A. T. M. Johnson and F. H. Varley for "cheap cable messages and secret wireless telegrams," was given at 37A Finsbury Square, London, E.C. The apparatus was arranged round the sides of a small room, and consisted mainly of instruments used to demonstrate the principles employed by the inventors, being of a more or less experimental character. The following is the account of the demonstration given in the *Electrical Review* :

"The idea at the base of both systems is that of syntony obtained by means of tuned reeds ; each letter or numeral is represented by a sending and a receiving reed of identical pitch, and it is claimed that the tuning is so sharp and the system is so free from interference between signals of only slightly different pitches, that forty-nine differently tuned signals can be obtained within the range of one semitone. Obviously, in theory at least, each letter or other signal could be transmitted by depressing a given key on a suitable keyboard, which would actuate the corresponding sending reed, and the signal would be picked up at the receiving station by a similar reed connected to a recording device. Thus a message could be transmitted as fast as it could be written on a typewriter.

"But while this is very pretty and plausible, it fails to take due account of practical conditions. And this is, perhaps, not surprising in view of the fact that the chief inventor appears to be Mr. Johnson, who was formerly a Professor of Music in Victoria, and therefore could hardly be expected to be fully conversant with the working of submarine cables. That Mr. F. H. Varley, who is associated with Mr. Johnson in the matter, did not enlighten his colleague is less easily explained.

"The demonstration consisted for the most part of elementary explanations of the behaviour of tuned and untuned reeds, with which our readers need not be troubled. Unfortunately, even on a subject so closely related to his own profession, Mr. Johnson's views are unreliable, for one of the essential features of the system is that the rate of vibration of reeds is uninfluenced by variation of temperature. He essayed to explain the statement by pointing out that change of temperature would cause change of all the dimensions of the reed in the same proportion, and claimed to prove it by an experiment with a pair of tuned reeds and a saucepan of hot water, which carried conviction to no engineer's mind. But the professor appeared to be unaware that the frequency of vibration of a reed varies as the thickness, and inversely as the square of the length, so that proportionate variation of dimensions with temperature *must* cause change of pitch, while the decrease of elasticity with increase of temperature aggravates the error.

"The wireless part of the affair was more directly in Mr. Varley's hands. While utilising the same principle, it is claimed to be an untappable system. A stream of waves is emitted under the control of a reed slightly out of tune with the receiving reed, which is therefore unaffected ; the signals are transmitted by the aid of a key which modifies the sending reed, so as to bring it precisely into tune with the receiver, which is, therefore, affected when the key is depressed. It is claimed that an outsider would not be able to distinguish the very slight change of pitch which marked the sending of each signal. We doubt this, under practical conditions. But even if it be true, the fact that a station thus sending out a continuous train of waves seriously interferes with all other stations within range is a very grave objection. That it does so we know from the mouth of Mr. Johnson, who informed our representative that a certain English coast station was, to use his own expression, 'paralysed' and unable to receive any signals while the Johnson-Varley apparatus was at work.

"We have said enough to show that, in our opinion, the inventors are dealing with matters with which they are not at all conversant, and we fear there is a painful disillusionment awaiting them. Fortunately, as one of the promoters informed the audience, they 'are not out for money,' as they claim to have a financial backing. Appearances belied the statement ; but at all events, they are unlikely to obtain support in electrical circles."

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Journalism's Debt to Mr. Marconi

CONTRIBUTIONS amounting to £1,218 were announced at the festival dinner of the Newsvendors' Benevolent and Provident Institution, held during the past month at De Keyser's Royal Hotel, London. In the regrettable asbence of Mr. G. Marconi, the chair was taken by the president, the Hon. Harry Lawson, M.P.

In proposing the toast of the evening, the chairman observed that they had all been looking forward to welcoming Mr. Marconi. He was one of the greatest living benefactors of mankind. He had annihilated distance, relieved anxiety, and added happiness to all the people upon the earth. It was not a small thing that he should enable them to converse, no matter what distance separated them. Those interested in newspapers owed him a debt of gratitude, because they believed that through his agency they would be able, not only directly, but indirectly, to increase the amount of news that they gave to the public, and to get it at a more reasonable cost. Personally he should have been glad to welcome him as a distinguished Italian. Whatever might be the circumstances of the hour, they did not forget that they had no firmer friends on the Continent of Europe than the Italian nation. They admired the Italians for their unquenchable patriotism and for undaunted enthusiasm. Speaking of the institution, he remarked that Mr. Marconi, in his plea on behalf of the institution, said if the committee were to keep pace with the sad appeals they must have more funds at their disposal. At present, continued the chairman, there were eighteen persons in great distress who were candidates for election to permanent pension benefit—thirteen newsmen and five newswomen.

Mr. Bram Stoker, in responding to the toast "Literature and the Press," said that no man in war, in exploration, in science, or any other form of human endeavour could succeed without imagination. For that reason and no other he said that imagination was the basis of literature. Let them take, for example, the great work done by Mr. Marconi. A long time ago Isaac Newton reasoned out that something more than the atmosphere in which we lived was necessary to produce the effects which were provable by science, and he dreamed a great dream, that there was something in the universe which had not yet had a name. It fructified, and in due season Kelvin's hypothesis taught us the beginning of astral worlds. Then came Mr. Marconi, who carried into practical use the discoveries made by himself and even before his time.

Wit by Wireless

Mr. Walter Emanuel, the famous humorist, whose witticisms adorn a well-known page of *Punch* each week, and who has enlivened many a public banquet by reading imaginary telegrams from celebrities unable to attend, has now "adopted" wireless telegraphy for the latter occasions, as a result that these telegrams have increased in quantity. At a dinner of the Authors' Club, on December 18th, he read the usual series of wireless telegrams, of which the following specimens are representative:

The Kaiser: Sorry! I don't mind your plum-pudding, but I cannot stand your "mean-spies."

Mr. Lloyd George: Do you expect Bobbie Cecil? Anyhow, I don't think I will come. You know my hobby. I might even tax your patience.

The Mayor of Calcutta: Sorry cannot afford to come, owing to sudden loss of capital.

An invitation sent to the new Censor of Plays, and addressed to "Dear Old Charlie, care of the Lord Chamberlain," has been returned marked "Unknown."

On Inventors

Near the door of a patent agent's office there appeared a typed notice to the effect that the average inventor was a crank, whose ideas of his own importance were in inverse ratio to his capacity for business. This seems rather cruel on the man who is looking for financial assistance to develop what he believes to be a money-making invention, but it is probably true that not one in ten of the ideas for which patents are granted are worth the paper on which they are printed. The curious thing is that with multitudes of ingenious minds at work so many problems in mechanics should remain unsolved. There are the innumerable inventions that nobody needs—a case in point being an electric machine for enabling legislators to record their votes without leaving their seats. When, with pardonable pride, the inventor explained this apparatus to the authorities at Washington, they rebuffed him by telling him that it was the last thing in the world which the House of Representatives wanted.

Messrs. A. W. Gamage, Ltd., of Holborn, London, are exhibiting and working amateur sets of wireless telegraphy made under licence from the Marconi Company. Needless to say, it is difficult to get anywhere near the operator while the sets are working.

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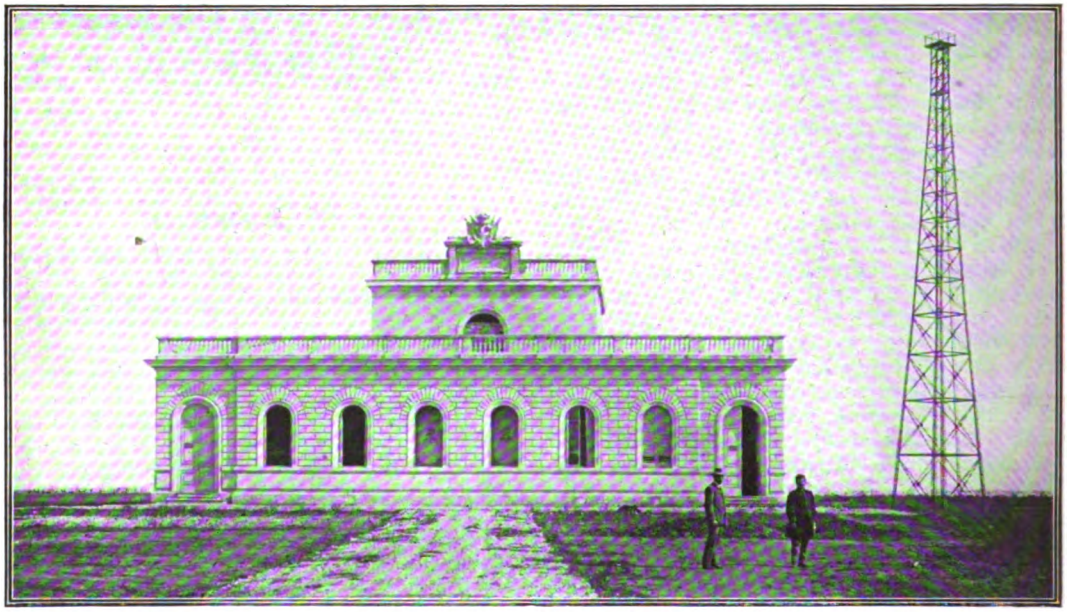
The Marconi Station at Coltano.

A Triumph of Genius.

THE progress of wireless telegraphy has just been marked by the installation of a station at Coltano, in Italy, which is capable of transmitting and receiving messages to and from 10,000 miles or more. It is the most powerful station yet constructed, and the calculation of its range is based upon the fact that the Transatlantic station at Clifden, in Ireland, which has a considerably lower power, recently succeeded in communicating a message to Buenos Ayres, 7,000 miles distant. The importance of the development is emphasised by the opening of the high-power stations at Cadiz, Barcelona, Teneriffe, and Las Palmas, at which both internal Spanish telegrams and external telegrams will be worked, and that these stations will immediately open services with Italy and with England and other countries. Thus the gradual co-ordination and world-wide efficiency of wireless telegraphy is approaching completion. The map on p. 9 shows the position of that station and its relation to other stations.



Exterior of Marconi Station at Coltano.

The Coltano station was inaugurated under the personal direction of Mr. Marconi. Its available power is 1,000 kilowatts, as compared with Clifden's 500 kilowatts, and it is expected that the projected South American stations will be in communication with it.

An interesting incident prior to the opening of the Coltano station is reported. Mr. Marconi desired to communicate with the Marconi stations at Clifden, in Ireland, and Glace Bay, in Canada, and accordingly sent telegrams by ordinary wires and by cable to those stations requesting them to tune up and be prepared to communicate with Coltano at a given hour. Later in the day, however, a telegram was received by Mr. Marconi informing him that his telegram had been received but was unintelligible owing to the storm. Whereupon Mr. Marconi decided to call both Clifden and Glace Bay by wireless, and at four o'clock sent a message from Coltano to Clifden, and received the immediate reply: "Your signals are strong and readable." With Glace Bay

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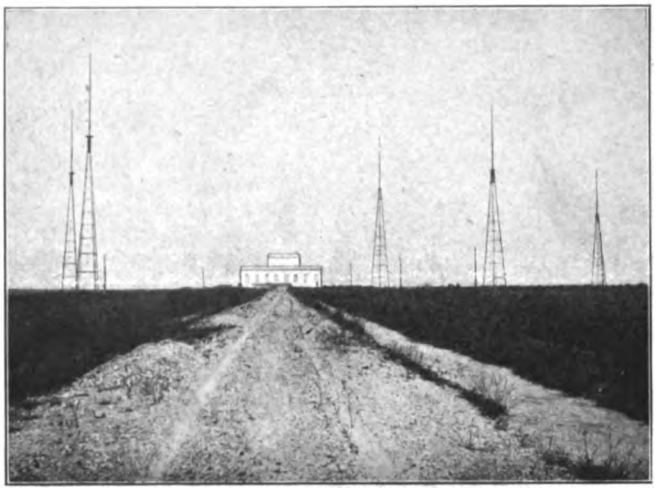
(Canada) equally satisfactory communication was at once established. In reply to the telegram sent by Mr. Marconi to the Italian Minister of Posts and Telegraphs advising him of the successful opening of the station, he received the following telegram :

" I thank you for your kind telegram, which I will make a point of communicating to-day to my colleagues of the Cabinet. The intimation that Coltano is now able to transmit to and receive from your English and Canadian stations will be much appreciated by my colleagues, as well as by the whole country. The transoceanic radiotelegraphic communication by means of the new high-power station will add to the triumph of your genius, and is a new instrument of civilisation and glory to the country."

The idea of building a great wireless station at Coltano suggested itself to Mr. Marconi on board the s.s. "Carlo Alberto," of the Italian Navy, where he was at the time carrying on interesting experiments. Mr. Marconi was greatly encouraged in his idea by Admiral Mirabello, who was in charge of the vessel, and who was impressed by the fact that off the south of Cagliari the vessel could transmit messages across Europe, the Alps, and part of the Mediterranean Sea from Poldhu with great ease. The Italian Government approved and accepted the proposal, and the Hon. Galimberti put the proposal before the Italian Parliament.



Distant View of the Aerials at Coltano.

The station has now been handed over to the naval authorities, and upon hearing of its successful completion and working the Minister sent the following message to Mr. Marconi :

" I send you most hearty congratulations on the completion of the high-power station at Coltano, which adds new glory to your name and permits Italy to stand at the head in the new field opened by your great invention. Greetings.

" Leonardi Cattolica."

Mr. Marconi replied as follows :

" Your Excellency has so kindly wished to congratulate me for the results obtained at the Coltano station, but on my part I wish to express my pride and pleasure in having to note the skill and high efficiency of the men of the Royal Navy, who are so ready to help in each branch which represents a new conquest of science and of strength."

As soon as the Marconi Wireless Telegraph Company of London were advised that the Coltano station was opened the managing director, Mr. G. C. Isaacs, sent the first marconigram via Clifden and Coltano to Queen Margherita conveying congratulations upon her birthday, and received in a very short time by the same route Her Majesty's acknowledgment and thanks. On December 11th the Marconi stations of Massowah and Mogadiscio on the East Coast of Africa were opened, and these towns will now be in direct communication with Italy by wireless telegraphy.

Mr. Marconi has received a warm telegram of congratulation from the King of Italy.

Messrs. Macnaughtan Brothers, of 190 West George Street, Glasgow, have been appointed sole agents in Scotland by the Marconi International Communication Co., Ltd., of London.

The appeal for funds to equip the expedition which Mr. Douglas Mawson is leading into the Antarctic has met with so generous a response, that for the first time in the history of Polar exploration the explorers will be able to keep in constant touch with the outside world by wireless telegraphy. With the aid of the Marconi Company, Mr. Mawson proposes to set up a station in the Antarctic, and to establish easy communication with some station in Australasia.

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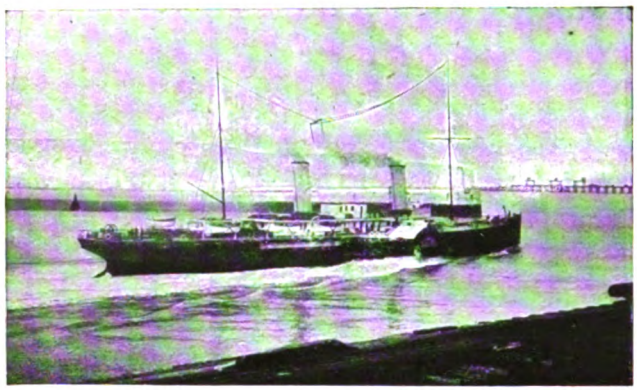
Maritime Wireless Telegraphy

THE past month has been one of the most trying for the cross-channel steamers, but they have survived the ordeal splendidly, and without mishap. This is not surprising to the countless thousands who have crossed and recrossed the Channel, say, in the modern and well-equipped vessels owned by the Belgian State Railways and Royal Mail Service. These vessels run between Dover and Ostend, and not the least important feature of them are the wireless telegraph services, which are a boon to anxious friends or business men concerned about a vessel's delay in an extremely rough crossing. We hope at a later date to describe the cross-channel services and their wireless equipments more fully; meanwhile



Dover-Ostend Steamer.

the management of the Belgian Royal Mail steamers deserve to be highly congratulated upon having carried out an uninterrupted service, and to have even added special holiday services during the rough weather of December.

✦

Wireless brought help to two distressed coasters which were being battered on Nantucket Shoals (U.S.A.), the revenue cutter "Gresham" (called by the Charlestown Navy Yard), speeding down from Gloucester to send a helping line to the two-masted schooner "Henry May," bound from New York for an Eastern port, while the cutter "Acushnet" (called by the wireless station at Newport) steamed down Nantucket Sound from Woods Hole and hauled the schooner "William Mason," bound from Long Cove, Me., for New York, to anchorage off Hyannis. This is the second time the "Acushnet" and "Gresham" have been hastily summoned by the wireless to give aid on the Nantucket Shoals.

✦

The "Prinz Joachim," which ran aground off the Bahamas recently, might have been in a sad plight but for the services of wireless. The first wireless message received in New York came from the coastwise steamer "Panama," off Cuba, and said: "Wireless operator on 'Prinz Joachim' is sending C.Q.D. signal. Is aground on Samana Island." A few minutes later the following marconigram, twice relayed by Atlantic coast liners, was caught at Fire Island and flashed on to New York. It was from the wreck, and signed Fey, the "Prinz Joachim's" captain: "Struck the rocks off Samana at 3.50. At work on cargo. Taking in water. All ready abandon ship. Six o'clock coffee served. Passengers all calm. Vessel resting easily. No danger, but cable help." Samana Island is one of an uninhabited series of rocks in the Bahama group, 200 miles north-west of Haiti, 30 miles east of Fortune Island, and 150 miles south-east of Salvador Island, where Columbus landed. Mr. W. J. Bryan was one of the distinguished passengers on board, and he sent the following wireless message to his brother in Lincoln, Nebraska: "Aground a mile from shore. Don't worry."

✦

The following vessels were fitted with Marconi 1½-kw. and emergency plants during the month ended December 18th: "Circassia," "Castalia," and "Columbia," for the Anchor Line; "Maunganui," the Union Steam Ship Co. of New Zealand; "Montoro," Messrs. Burns, Philip & Co.; "Nigeria," the Elder Dempster Line; "Arcadian," the Royal Mail Steam Packet Co. The vessels in course of equipment at the date mentioned include: "Akabo," the Elder Dempster Line; "Caledonia" and "California," the Anchor Line; and "Princess Patricia," the Canadian Pacific Railway Co.

✦

Instructions have been received to equip the

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following vessels: "Ekma" and Nos. 497–8, the British India Steam Navigation Co.; "Huallaga," Compañia Peruana de Vapores y Dique del Callao; "Irishman," the White Star Line; "Bruce," Reid & Co., Newfoundland; "Adventure," "Bellaventure," "Bonaventure," and "Newfoundland," Harvey & Co., Newfoundland; "Amber," the Eastern Telegraph Co.; and "Ramos," the Amazon Cable Co.

The Marconi Company have contracted with Messrs. Vickers for the equipment of the Chinese school-ship cruiser just completed at Barrow. The installation will consist of a 3-kw. motor generator set, producing, by means of the Marconi disc discharger, a musical note of 700 frequency. In addition to the magnetic detector, the receiving apparatus will include a valve-tuner set. Space is to be found in the ship for the installation of six sets of practice apparatus to be used in the instruction of the Chinese cadets. The transmitting range of the apparatus will be 250 miles by day, and from two to three times that figure at night under favourable conditions, and the receiving range will, no doubt, be considerable, thanks to the provision of the valve tuner.

Another Marconi Triumph

THE new stations in Spain (described on page 9 of this issue), and particularly the Cadiz station, have recently been put to a severe test by the unfortunate wreck of the P. and O. steamer "Delhi," and they have come through the ordeal magnificently, constituting a new triumph for Marconi. Shortly after midnight on the morning of December 13th the "Delhi," conveying the Princess Royal, the Duke of Fife, and their daughters Princesses Alexandra and Maud, to Egypt, went ashore two miles south of Cape Spartel. Cape Spartel stands to the west of Ceuta and nearly opposite Gibraltar on the north-western extremity of Africa. It rises to a height of over 1,000 feet above the sea level, sloping gradually to the water.

The Cadiz station began receiving marconigrams from the "Delhi" about two o'clock in the morning, the message indicating that the vessel was in a dangerous position, and probably ashore. Demands were made for urgent help in order to avoid the imminent danger of a catastrophe. The message gave the position of the "Delhi" as two miles south of Cape Spartel, with a heavy sea running. The Cadiz station immediately transmitted the message to the P. and O. Company's agents at Gibraltar, urging them to send help, at the same time communicating with any ships at sea in the vicinity which might take a message. The first answer came from the battleship "Prince of Wales," and was followed immediately by another from the "Duke of Edinburgh," which left Gibraltar at once for the scene of the disaster. Inquiries came during the whole of the following day from England by wireless, Queen Alexandra herself sending messages. The Spanish National Wireless Telegraph Co. are to be congratulated upon the successful manner in which they came through a trial of great emergency.

A naval correspondent writes to the *Standard* from Portsmouth: "The official 'explanation' given here of the failure of the 'Delhi' to communicate with Gibraltar is that of late flagships have been so hampered by taking in wireless messages that orders for the fleet to 'stop talking' have been quite common. On this principle, the ignoring of any private message is easily explained."

Windmill Hill, Gibraltar, like many, if not all, other Admiralty stations, says our contemporary, is permitted to answer the distress call from commercial ships. But no answer was returned to the "Delhi." An Admiralty official, with great sangfroid, explained it. "The 'Delhi's' apparatus would send out its messages with one or both of two wave-lengths —namely, 300 and 600," he said. "Now the Admiralty stations only receive messages, as a rule, tuned to wave-lengths varying from 600 to 1,600. Hence the chance of an Admiralty station receiving a signal of distress from a commercial vessel at any time—although the Admiralty expressly states in its regulations that such messages may be received and acted upon—is remote. That is undoubtedly what happened. While the British warships were unacquainted with the serious position of the 'Delhi' the 'Friant,' a French cruiser, was rushing to the rescue."

Luckily, the point that emerges is that around our own coasts new Admiralty stations are continually being established. The appalling number of shipwrecks serves to emphasise not only the necessity for a wider application of wireless telegraphy, but for the establishment at every Admiralty station on our shores of receivers which can always take the signal of distress.

The Spanish Press is enthusiastic over the timely rescue effected through wireless, as the following extract from *El Diario Universal*, of Madrid, shows: "The magnificent invention of Marconi, the wonder of the age, has rendered yet another service to humanity. It is due to his invention that countless families are not mourning at the present time losses from sea tragedies. For such an admirable communication has been the result of saving hundreds of passengers who within a few hours found themselves in danger of losing their lives."

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Foreign News

China.

An extraordinary development of banking, aided by modern science, has been in progress during the revolution in China. The city of Hankow has been in the thick of the fighting, yet amidst all this tumult business has been carried on and moneys in large amounts have passed between Hankow merchants via London. Telegrams have been sent by the Marconi system, and have reached Shanghai, whence they have been forwarded to London. On these messages moneys have been paid on the order of persons in Hankow to the credit of other parties of that city. Incredible as it may at first appear, this new form of banking seems to be carried on on perfectly safe principles, all the parties in London being satisfied on the point. Certainly, what with money being transferred in London by wireless telegraphy from a city in rebellion in China, and China itself proclaiming a Republic, things seem to be moving.

Egypt.

The Marconi wireless station at Port Said was opened on December 1st, 1911. The call letters of the station are MPD, and the wave-lengths 300 and 600. The station is open day and night for general public service, and the coastal rate is 0.60 francs per word. For radiotelegrams to or from Egypt there is a tax of 0.75 francs per word in the case of lower Egypt, 0.90 francs per word in the case of upper Egypt, and 1.15 francs for the Soudan. This tax includes the coastal rate and the rate for transmission across land lines.

Italy.

The Italian Administration have announced that radiotelegrams sent to wireless stations on the coast of Italy for transmission to vessels are only accepted at the risk of the senders. These messages must be written in plain language.

Japan.

M. Kenjiro Komatsu has been transferred rom the position of Director-General of Posts and Telegraphs to that of Vice-Minister of Communications, in place of M. Ren Nakakoji, retired. M. Jiro Tanaka has succeeded M. Komatsu.

Russia

According to the *Rossiya*, a special conference has been held in the Russian Post and Telegraph Department for the organisation of radio-telegraphic stations on the coasts of the White Sea and Kara Sea for ships navigating to the mouths of the Obi and Yenisei. The conference decided upon the establishment of stations on Vaigatch Island, on the coast of the Vaidaran Bay, and on the Ugorski Shar Strait. The work is to be carried out in the course of one year if possible, and in two at the most.

Turkey.

An Imperial decree has been issued appointing His Excellency Ibrahim Bey Soussa Minister of Posts, Telegraphs, and Telephones of the Empire, in place of His Excellency Stamboulian Effendi.

United States.

The United States Civil Service Commission, Washington, D.C., recently held an examination at various cities throughout the country to secure candidates from which to make certification to fill a vacancy in the position of electrician and wireless telegraph operator at a salary of $900 per annum, for duty in the lighthouse service in the Territory of Hawaii, and vacancies requiring similar qualifications as they may occur. Considerable difficulty has hitherto been experienced in securing suitable candidates for the position mentioned.

An operator at the Marconi station at Sagaponack, New York, recently picked up from the road near the station a live bird, badly wounded, of a species so rare and unknown in that locality that no one could name it. It was eventually identified as a bird of the Arctic regions, and its incursion so far south is regarded as a sign of very cold weather.

Science, like art, should have no national frontiers, though there are sad instances of the fracture of the rule, as when Wagner was banned in Paris and Heine in Berlin. That makes the outbreak against Madame Curie, the distinguished scientist, on the ground that she is French only by marriage and a Pole by birth, somewhat unaccountable. The Galileos, the Newtons, the Darwins, the Marconis are citizens of the world, and as all benefit from their discoveries and inventions, each should be proud to afford a domicile and an address.

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Presentation at Clifden

There was a large gathering of the staff at the Railway Hotel, Clifden, on Friday, November 24th, on the occasion of a presentation of a handsome white onyx timepiece to Mr. Spencer W. Purser on his promotion to a position in the head office of the Marconi Co. in London. Mr. T. F. Gaynor, who presided, referred to the many sterling qualities of the guest of the evening, and Mr. O'Driscoll, who made the presentation, said they had been associated both officially and socially for a number of years, and he considered that Mr. Purser's departure was a matter for regret. Mr. Hosking referred to the severance which was about to take place, and dwelt on Mr. Purser's hospitality. What was Clifden's loss would, he felt sure, be London's gain. Mr. Webb desired to associate himself with what had already been said. He hoped Mr. and Mrs. Purser and family would enjoy every success and prosperity in their new sphere. Mr. Rogers also paid his tribute, referring to Mr. Purser's kindness and help during his early days in the Transatlantic service. Mr. Norris said that, although he was a new arrival at Clifden, there was no one to whom he would concede one iota of the esteem he held for Mr. Purser.

Mr. Purser, with characteristic modesty, thanked the members of the staff, and assured all that he would not forget them and their kindness on this and many other occasions.

Music followed the speeches, and songs were ably contributed by Dr. Gorham, Messrs. O'Driscoll, Gayner, Norris, and Hosking. Mr. Purser, whose mastery of the banjo is well known, effectively rendered "The Letter-Writing Coon" and his old favourite "The Phantom Bride." A vote of thanks to the hotel management for the admirable arrangements that had been made brought an enjoyable evening to a close.

Marconi Athletic Club

A whist drive was held at the Marconi Athletic Club rooms, Chelmsford, on December 16th. Miss A. Oddy won the lady's first prize, Mr. A. Hazleton the gentlemen's, and Mr. G. Watling the consolation. About forty members and friends were present, and refreshments were provided.

On December 18th a whist and billiard match with the Arc Works Club took place. The results were as follows: Whist—Arc Works, 37, Marconi's, 12; Billiards—Marconi's, 3, Arc Works, 1.

Movements of Engineers

R. N. Vyvyan, having recovered from illness, has returned to Madrid and resumed his charge of the Spanish contract.

H. Caswall has been carrying out special tests at Varna, Bulgaria, and during his absence the installation at Constantinople has been under the charge of C. James.

Mr. Entwistle, under whose supervision the Coltano station has been erected, has returned to London for a time.

F. Post is on his way home from Balik-Papan.

R. K. Rice has arrived in Ceylon, and is in charge of the erection of the new station at Colombo.

J. J. Leary, C. H. Keith, and R. H. Strickland have arrived in England from the Fiji Islands.

A. D. Kent has been transferred from the Chelmsford Test Room to Antwerp, where he is engaged in testing apparatus.

Movements of Operators

R. Sweetham has been transferred from the "Empress of Britain" to the "Suevic."

F. G. Short has been transferred from the "Guelph" to Vigo (Spain).

J. H. Golding has been transferred from the "Inkosi" to the "Arawa."

C. A. Hill has been transferred from the "John Pender" to the "Orama."

H. E. Hardy has been transferred from the "Mesaba" to the "Kildonan Castle."

C. H. Bartlett has been transferred from the "Suevic" to the "Minneapolis."

F. J. Gowlett has been transferred from the "Andorinha" to the "Ballarat."

P. A. Roberts has been transferred from the "Aragon" to the "Avon."

E. D. Bagot has been transferred from the "Vectis" to the "Olympic."

L. L. Jones has been transferred from the "China" to the "Aorangi."

A. H. Clarke, from the "Persic" to the "Aidan."

H. S. Bride, from the "Lanfranc" to the "Anselm."

W. McGhee, from the "Empress of Ireland" to the "Carmania."

A. J. Osborn, from the "Corsican" to the "Gloucestershire."

T. Knox, from the "Teutonic" to the "Corsican."

S. V. Branton, from the "Empress of Ireland" to the "Oceanic."

H. F. Coffey, from the "Huayna" to the "Durham Castle."

V. Gardiner, from the "Lake Manitoba" to the "Maunganui."

P. Doherty, from the "Celtic" to the "Laurentic."

T. J. Chapman, from the "Winifredian" to the "Derbyshire."

F. H. Baker, from the "Virginian" to the "Huayna."

T. Evans, from the "Lake Champlain" to the "Persic."

J. R. Thomson, from the "Laurentic" to the "Lanfranc."

L. Dodds, from the "Virginian" to the "Laconia."

S. Stacey, from the "Lusitania" to the "Montoro."

C. S. Gordon, from the "Oceanic" to the "Delhi."

N. M. Drysdale, from the "Volturno" to the "Macedonia."

E. J. Moore, from the "Edinburgh Castle" to the "Olympic."

R. Harding, from the "Ascania" to the "Gaika."

A. W. O'Connor, from the "Dominion" to the "Minneapolis."

B. Gale, from the "Ionian" to the "Erinpura."

F. J. Henderson, from the "Oriana" to the "Rotorua."

W. H. Haywood, from the "German" to the "Galician."

C. H. Bartlett, from the "Minneapolis" to the "Volturno."

E. J. Trail, from the Marconi School to the "Winifredian."

J. A. Pritchard, from the Marconi School to the "Empress of Britain."

W. Raw, from the Marconi School to the "Celtic."

H. J. Lightfoot, from the Marconi School to the "Laurentic."

L. B. Cleary, from the Marconi School to the "Teutonic."

C. Whitaker, from the Marconi School to the "Empress of Ireland."

C. F. Evans, from the Marconi School to the "Californian."

J. D. Cannon, from the Marconi School to the "Baltic."

Transfers of Operators in the American Co.

M. C. Tierney, from "Sea Gate" to Siasconset.

R. M. Fennell, from the "Maracus" to the "Curityba."

K. McAlpine, from the "Philadelphia" to the "Florizel."

C. J. Weaver, from the S.Y. "Noma" to the "Philadelphia."

B. P. Adams appointed to the "Maracus."

J. H. Sellars appointed to the "Grenada."

T. Chattaway resigned.

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THE MARCONIGRAPH

No. 11. February, 1912. Subscription, 3/- per annum, post free. Price 2d. Post Free 3d.

The Triumph of Wireless Telegraphy

By L. G. Chiozza Money, M.P.

[What follows is an extract from an article which this distinguished writer on economic and social subjects contributed on January 11th to the *Morning Leader*. Whilst Mr. Money cannot claim the credit for any startling revelations in his article (for have not the facts which he records been proclaimed in the world's newspaper press, and focussed in the columns of THE MARCONIGRAPH ?) he certainly has rendered a service to the cause of humanity in reminding mankind of the great debt which it owes to the successful development of wireless telegraphy. The din of the hostile critics who (unconsciously, perhaps) attempted to mislead the public in the early days of wireless telegraphy, has been effectively silenced by the brilliant work which Mr. Marconi has quietly pursued, and those who "came to jeer remained to cheer," except "the would-be poachers"—a term so aptly coined by Mr. Money.—EDITOR.]

NOW that wireless telegraphy has triumphed everywhere, in peace and in war, on land and on sea, I recall with considerable amusement the extraordinary manner in which Marconi was treated by scientific men while solving the great problem. It is only a few years ago—I remember it as though it were yesterday—since Marconi announced to the world that he had succeeded in sending a wireless signal—the letter "S"—across the Atlantic. Immediately the detractors were up in arms. It was nonsense; the reading was an error; it was deliberate deception; it was another prank of the "young man with a box," as one scientist called the inventor. To-day, we know that the signal was really sent and really received, and that, through Marconi's work, ships have been rescued, lives saved, and criminals captured on the high seas, and a means found to bring the corners of the world nearer than ever before. Marconi towers have been raised all over the world, and so practical has the system become that it is even a commercial success. Marconi can afford to smile and to look back with indifference upon those who scorned and impeded him. The situation has so changed that his chief difficulty now is in coping with the many would-be poachers upon his preserves. It was impossible—but it is worth stealing.

Amongst the most recent Marconi triumphs is the saving of the passengers and crew of the "Delhi." There is little doubt that there would have been great loss of life, and that members of the British Royal Family would have perished, but for the transmission and picking up of a wireless call for help. The saving of life at sea through the use of the Marconi telegraphy must now be considerable in the aggregate. Another recent instance was the running aground off the Bahamas recently of the Prinz Joachim. Help was secured by wireless, and Mr. W. J. Bryan, one of the distinguished passengers, was able to send through space a message announcing his safety to his brother in Nebraska. In war wireless telegraphy will also be used increasingly. Here is a means of communication whose connections cannot be destroyed without great scientific knowledge, if at all, and a column can leave its base without fear of being cut off from signalling.

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MR. MAURICE TRAVAILLEUR.

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Maurice Travailleur,

Managing Director of the Compagnie de Télégraphie Sans Fil.

MANY of our readers are, no doubt, familiar with Maeterlinck's beautiful story of the Blue Bird, which delighted so many thousands, old and young, during the past Christmas season. In one of the scenes of this touching piece the little heroes are shown to us in the pursuit of happiness—the Blue Bird in the Kingdom of the Future. They are telling each other what they are going to do later on ; one is to originate great things, and the other is to help him in their fulfilment. Without being too unrealistic, the poet might have depicted in the little hero of the future the great inventor Marconi, and in the small companion who might say, "And I shall want to work for you, side by side with you, to make known and nurture what you have created, long and far until the rainbow ends," one of the inventor's ablest collaborators.

Amongst the phalanx of fellow workers, old and new, who have gathered around Guglielmo Marconi, amongst the interesting personages which it is the custom of THE MARCONIGRAPH to present successively to its readers, quite a special place is due to Maurice Travailleur, the active and devoted managing director of the Compagnie de Télégraphie Sans Fil of Brussels.

From the earliest days of the great work which is of such common interest to the wireless world, he was an undaunted pioneer, convinced of eventual success. It can be truly said of him that seldom was anyone more fitly named and never was anyone prouder of such a name as the one he bears—he is indeed, a prodigious "worker."

Maurice Travailleur was born in Brussels in 1871, and graduated as engineer at the Brussels University in 1893. Immediately afterwards he entered the service of the India Rubber, Gutta-Percha and Telegraph Works Co., of Silvertown, and under the direction of Mr. Stuart Russell was engaged in the construction of the central electric station of the city of Brussels, and also of the distribution network, both of which had been entrusted to the Silvertown Company. Upon the completion of this work Mr. Travailleur was transferred to the Brussels Municipal Service as engineer of this enterprise.

At 26 years of age he was appointed Electrical Engineer to the King of the Belgians, and filled this delicate position until the death of Leopold II. He continues to occupy the same post under His Majesty King Albert. It was in this capacity that his attention was drawn, towards the close of 1898, to the experiments of Mr. Marconi. Having pointed out the immense importance of these experiments to Colonel Thys, then aide-de-camp to King Leopold, and the founder of numerous and important financial and colonial enterprises, he was instructed by the latter gentleman at the commencement of 1899 to enter into relation with Marconi's Wireless Telegraph Co., Ltd., of London. At the first meeting with the Company he at once comprehended the extent of the new domain laid open by the genius of the inventor, and in an almost prophetic manner saw the possibility and desirability of effecting the telegraphic administration of the ocean by centralising in one international organisation the working of wireless telegraphy As a result of the negotiations entered into by Colonel Thys and Mr. Travailleur with the Marconi Wireless Telegraph Co. it was decided a few months afterwards to found the Marconi International Marine Communication Co., Ltd., and that Company was constituted at the end of April, 1900.

At this period Mr. Travailleur left the Brussels Municipal Service to become a director of the Marconi International Marine Communication Co., Ltd., and to be its manager for the Continent. In October, 1901, the continental branch of the International Company was transformed into a special Company, bearing the name of the Compagnie de Télégraphie Sans Fil. Mr. Travailleur became managing director of this Company and occupies this position at the present day. He joined the Board of the Marconi's Wireless Telegraph Co., Ltd., last year, and is also a director of the Deutsche Betriebsgesellschaft für drahtlose Telegraphie.

In addition to his occupations in the domain of wireless telegraphy, Mr. Travailleur, who is a Chevalier of the Order of Leopold, finds outlets for his inexhaustible energy in the administration of many industrial enterprises, chiefly electrical and colonial, and he is director of several companies. Maurice Travailleur is not a believer in the word impossible. He is the type of the modern engineer, daring, full of conviction and enthusiasm, practical and prudent. With his fertile activity and ambition to do greater things, he will continue, in an ever-increasing measure, in the direction of enlarging to-day what were regarded as the limits of possibility yesterday.

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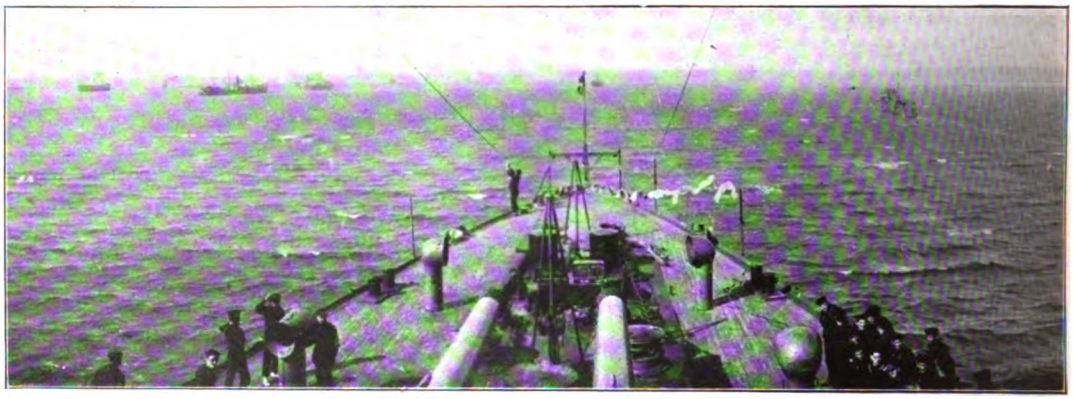
Wireless in Warfare

Lessons from the Tripoli Campaign

(Photographs by Mr. G. Marconi)

TUCKED away in a pocket of the Mediterranean five hundred miles from the main highways of sea travel, transformed and magnified under the magic sunlight of Africa, Tripoli lies in an oasis on the edge of the desert, dipping her feet in the ebb and flow of the sea. The whole vast territory has for long dwelt native and sequestered among the great solitudes which surround it, but for how long the primitive customs of the people will give way before the progressive aggression of a modern Power is a question which may be answered any morning by the daily papers.



H.M.S. "Pisa" approaching Tripoli, on board of which Mr. Marconi carried out most of his tests.

Tripoli is to-day the scene of a colonial campaign of a great Power, and is therefore of considerable interest, because it affords us the opportunity of judging the part which wireless telegraphy plays in the conduct of modern military operations. The military correspondent of the *Times* has furnished an excellent account of the important services rendered by wireless, and it will suffice to quote the following from the article contributed by that distinguished officer and writer upon military subjects :

"The Italian Army possessed about a dozen wireless field stations at the beginning of the war, mostly of 1½ k.w. power of Marconi design. There has also been used a knapsack station, which has given good results up to 12 miles, but there appear to be not more than two sets of this apparatus with the Army. Of the Marconi cavalry-type station and of the portable naval-landing station—both uncommonly useful designs—nothing has been heard, and there is no sign as yet that the cart equipment has been adapted for camel pack or draught. A pack equipment would have been valuable to Colonel Fara at Bir Tobras, and it will be most interesting to observe in what way the Italians, who are much further advanced than we are in wireless work, adapt their equipments to desert warfare.

"The Marconi 1.5 k.w. 1911 field station can work over about 100 miles of ordinary country and can be erected in a few minutes. The aerial is made as simple as possible, so that it may be erected easily, and the total weight of the station, including carts and *personnel*, is under 60 cwt. Supplies for two to four weeks' working are provided for each station. The changes of wave length of all circuits are effected by the movements of one handle, no syntonising being required when communicating with stations having the same system of wave lengths. The equipment is carried in the

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limber and wagon type of vehicle. The first limber takes the generating plant, and its wagon the transmitting and receiving apparatus. The second limber carries supplies and spare parts, and in its wagon are the masts, earths, and aerials. There have been great improvements made in the Marconi field stations of late, and it is now the rule that the transmitter shall not be sharply tuned, but that the receiver shall be capable of very sharp tuning.

"Some people think that secrecy can be preserved by the sharp tuning of the transmitter, but with a flexible receiver any good operator can pick up the messages; and if friendly stations can read signals, so also can similar receivers on the enemy's side. Until more definite results can be obtained by directional working with cart stations, there seems to be little doubt that rapid and constant changes of wave length, combined with the use of varying codes or ciphers, are the best means for securing secrecy. As the power to change wave lengths rapidly and without danger of confusion is very amply secured by the Marconi field stations, it is difficult to believe that the Turks will improvise any means for discovering the secrets of their enemy or for confusing transmission and receipt of messages. One would think that camel draught or pack would be much the best means of conveying the stations about, but it is not believed that the Italians have any design of camel pack ready, while, if draught is used, the tread of the wheels will have to be of special design, and the construction of all these things takes time. Motors

Mr. Marconi and Flag-Lieutenant on board H.M.S. "Pisa."

Street Scene in Tripoli. Wounded Italian soldiers being conveyed to hospital.

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suggest themselves as a possible alternative. Some photographs of Italian columns on the march show tracks which *prima facie* appear not unsuitable for motor lorries on certain stages, but over the undulating dunes and up the *djebel* gradients the use of motor transport will probably prove disappointing ; and on the whole it would be sanguine to expect an extensive use of the cart stations unless the camel is pressed into the service of the wireless plant."

The accompanying illustrations are from photographs taken by Mr. G. Marconi in Tripoli. In view of the attention now centred upon that district a few brief historical notes

Derna Station. This was formerly equipped with Telefunken apparatus, but was destroyed in the war. The station is now equipped with Marconi apparatus.

concerning the towns where wireless stations have been erected may be of interest. Tripoli is a region in Northern Africa included among the Barbary States. In its broadest extent it occupies the entire Mediterranean border between Tunis and Egypt, and lies just outside the tropics. The climate has its distinctive African characteristics, the summers are hot as well on the coast as in the interior, but sea-breezes render the former region quite bearable. Winter brings much cool and even cold weather, and snow rests for short periods on the upper hill slopes and occasionally on the basal plains. The average annual temperature of many parts of the interior is 80 degrees or more, and in Fezzan, at Murzuk, an extreme shade temperature of 135 degrees has been noted. Rains in the coast regions are not exceptional ; in Barca, the winter rainfall is 14 to 20 in. Tripoli proper and the *mutessarriflik* of Benghasi have together an area of about 400,000 sq. miles, and the population is estimated at about one million. The ancient name of Tripolis (*i.e.*, three cities) originated as a collective designation of the three cities of Œa, Leptis Magna, and Sabrata, situated on the Mediterranean coast, the first-named finally became known as Tripolis. The region formed part of the Roman Empire, and in later times there was a Provincia Tripolitana. In the seventh century Northern Africa became part of the Mahommedan world. In the middle of the sixteenth century Tripoli was subjected by the Ottoman Turks. The Tripolitans were repeatedly chastised by the French, and in 1801 to 1805 the United States waged a successful war against them

Of the great sea-walls and towers there are still imposing remains. From 1047 till it was taken by the Crusaders, after a five-years siege, in 1109, the ruling family was that of Ammar, which founded a library of over 100,000 volumes. Under the Crusaders Tripoli continued to flourish, exported glass to Venice and had 4,000 looms. In 1289 it was taken and destroyed by the sultan Kola'un of Egypt, and a new city was begun on the present site, which rapidly rose to importance. Its medieval prosperity has obliterated most relics of remoter antiquity. Tripoli had a troubled existence during the period of Ottoman weakness (the eighteenth and early nineteenth centuries), being frequently in dispute between the pashas of Aleppo and the rebel pashas of Acre. After the Egyptian conquest of Syria it was made the capital of a

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province in 1834 ; but in 1840 it reverted to the minor position which it now holds.

Bengazi, a seaport, is situated on the narrow strip of land between the Gulf of Sidra and a salt marsh. Though for the most part poorly built, it has one or two buildings of some pretension—an ancient castle, a mosque, a Franciscan monastery, Government buildings, and barracks. Senussi influence is strong and there is a large zawia (convent). The harbour is half silted up with sand and the ruins of fortifications, and is accessible only to vessels of light draught. A lighthouse has been erected at the entrance, but reefs render approach difficult, and the outer anchorage is fully exposed to west and north and not good holding. Consular vigilance has killed the once considerable slave traffic.

At the Outposts of Tobruk.

Mr. Marconi Testing Field Stations in Desert at Tobruk in the presence of Admiral Aubry.

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Founded by the Greeks of Cyrenaica under the name Hesperides, the town received from Ptolemy III. the name of Berenice, in compliment to his wife. The ruins of the ancient town, which superseded Cyrene and Barca as chief place in the province after the third century A.D., are now nearly buried in the sand. The modern town lies south-west of the original site. Certain large natural pits, which are found in the plain behind and have luxuriant gardens at the bottom, are supposed to have originated the myth of the Gardens of the Hesperides. Ancient tombs are found, which in 1882 yielded fine Greek vases to G. Dennis, then British Vice-Consul. The present name is derived from that of a Moslem saint, whose tomb, near the sea-coast, is an object of veneration. The population, amounting to about 25,000, is greatly mixed.

Derna, situated below the eastern butt of Jebel Akhdar, on a small but rich deltaic plain, watered by fine perennial springs, has a growing population and trade. The bay is open from north-west round to south-east and often inaccessible in winter and spring, and the steamers of the Nav. Gen. Italiana sometimes have to pass without calling. The population has recovered from the great plague epidemic of 1821 and reached its former figure of about 7,000. A proportion of it is of Moorish stock, of Andalusian origin, which migrated in 1493; the descendants preserve a fine facial type. The sheikhs of the local Bedouin tribes have houses in the place, and a Turkish garrison of about 250 men is stationed in barracks. A British consular agent is resident, and the Italians maintain a vice-consul. The names Darnis and Zarine are philologically identical and probably refer to the same place. No traces are left of the ancient town except some rock tombs. Derna continued to be of some importance in early Moslem times as a station on the Alexandria-Kairawan road, and has served on more than one occasion as a base for Egyptian attacks on Cyrenaica and Tripolitana. In 1805 the Government of the United States, having a quarrel with the Dey of Tripoli on account of the piracies committed on American shipping, landed a force to co-operate in the attack on Derna then being made by Sidi Ahmet, the elder brother of the Dey. This force, commanded by William Eaton, built a fort, whose ruins and rusty guns are still to be seen, and began to improve the harbour; but its work quickly came to an end with the conclusion of peace. After 1835 Derna passed under direct Ottoman control, and subsequently served as the point whence the Sultan exerted a precarious but increasing control over eastern Cyrenaica and Marmarica. It is now in communication by wireless telegraphy with Rhodes and western Cyrenaica.

Effect of 12-inch guns on Turkish Barracks at Bengazi.

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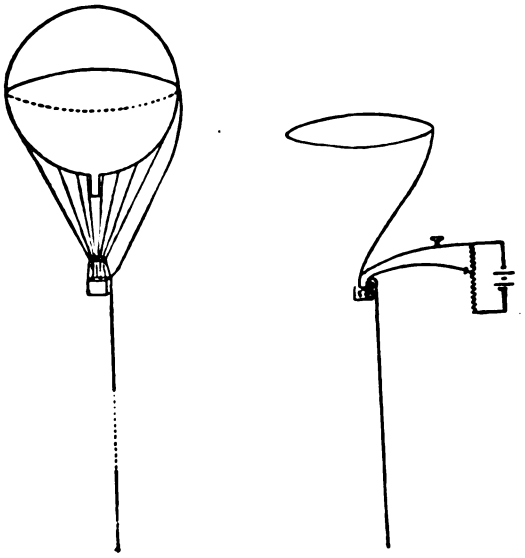
Wireless and Aircraft

BALLOON AS RECEIVING STATION. FACTORS OF MILITARY EFFICIENCY. FRENCH EXPERIMENTS.

AN account of the arrangement of the antenna for receiving wireless telegraph messages on balloons was recently given in the *Physcalische Zeitschrift* by Mr. P. Ludewig. When the balloon was half-filled a wire



Figs. 1. & 2.—Balloon as Wireless Receiving Station.

was wound round the equator of the gas-bag, being interwoven through the protecting cordage, and the end of the wire was placed in the basket. The wire formed the upper half of the antenna. To form the lower half a heavy wire was dropped from the basket after the balloon had risen. Fig. 1 shows the completed arrangement. The object of the tests was to discover with how simple means picking up of messages was possible. A Schloemilch cell was used as receiver, and this was connected direct to the antenna, as shown in Fig. 2, in order that as little room as possible should be taken up. With this arrangement accurate tuning was, of course, impossible. Approximation of the wave-length of 500 m. at the sending station was obtained when the wire from the basket was 125 m. long, or equal to one-fourth wave-length. The choice of the simple means for receiving also solved the problem as to whether damped or undamped waves should be used for sending, the small tuning capacity of the receiving station making the use of the first-named a necessity. Some of the results obtained in the tests, although not all, were satisfactory.

Recent military operations have confirmed the experience gained at the French Army manœuvres with regard to aeroplanes. In a recent lecture, Captain C. J. Burke, of the Army Air Battalion, claimed that the aeroplane was a part of the equipment of the modern army, as vital to its efficiency as motor transport and wireless telegraphy, though it was true that its value had not yet been fully appraised. Already it had revolutionised our methods of studying maps; rivers, mountains, and forests had lost considerably in importance. We have no doubt that Captain Burke had in mind the striking advantages of being able to communicate from an aeroplane with land or other stations by means of wireless telegraphy although he did not give prominence to that in his interesting lecture. That this is now possible has been previously shown in this journal, and was strikingly illustrated in the case of the Wellman flight described here recently. For an aeroplane scout, for example, to be able to communicate with his commanding officer is, of course, of primary importance, and it would be an immense advantage if he could exchange messages and receive commands. It is a matter of importance that the military authorities should be well acquainted with attempts that have been made to perfect wireless apparatus that will be suitable for aircraft, thus ensuring the greatest possible benefit being derived from the aeroplane.

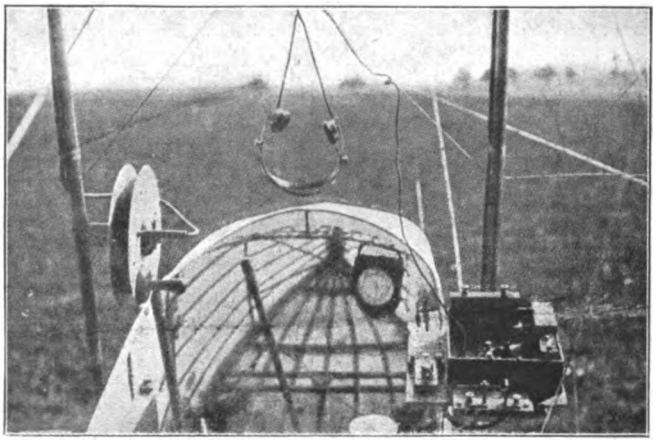


Fig. 3.—A Wireless Equipment on a Farman Biplane.

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Marconi Field Stations in Roumania.

By J. W. B. Simeon.

A VERY successful demonstration was given to the Roumanian Army with cavalry field stations in the beginning of November last. A description of these sets is unnecessary, as they have been fully dealt with at various times recently in the pages of THE MARCONIGRAPH, but several additions and improvements have been made. A new and more powerful alternator has been fitted, the size and weight remaining practically the same as the former type. The transmitter has been redesigned, better insulation being provided and the condenser battery more securely fixed. In the receiver box the main features are that the front is not divided equally, as in the older sets, but the lower half, which folds down, forming the table for the operator to write on, has been extended in order to give more room for the writing pad. A small electric lamp is provided for night working. The accumulators, which are of a new type, two instead of one being fitted, are quite unspillable, no matter in what position they may be placed. By means of a small and compact switchboard the valve detector and lighting lamp can be illuminated from the same or from either accumulator, and one or both accumulators can be charged through an automatic charging switch and resistance while messages are being sent. Screw terminals are used for the aerial and earth connections instead of plugs, and a special non-magnetic watch is mounted with the code times marked round the dial.

The demonstration was originally intended

Station near the Aerodrome at Bucharest.

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to take place during the army manœuvres in Moldavia, but the authorities said that they were too busy with other things at that time to give sufficient attention to Wireless, so put it off till November. On our arrival at Bucharest we found the two stations at the Cotroceni barracks, which is the depot of the Engineer Corps, all the customs formalities having been arranged bfeore we got there. The first day was spent in unpacking, testing every part of the apparatus, and showing it to the Engineer officers, who expressed themselves delighted with the neatness and compactness of the instruments and loads. They seemed a little sceptical about our being able to communicate as far as we claimed, but all doubts ceased when the stations were being worked over a distance of 60 kilometres with their own operators. They were particularly struck with the simplicity of the masts and aerial. The soldiers are quick and keen to learn, and only had to be shown once how to erect the masts, and, in fact, the whole station.

Roumanian Operators.

We took one station to Domniscii for a preliminary test, a distance of 10 kilometres, before the official trials commenced, on a hand-propelled trolly of the military railway which runs to all the forts round Bucharest; these forts are on the circumference of a circle with the city as centre, and a radius of about 10 kilometres. Meanwhile a Commission was being formed, and a programme arranged, after which the members came to the barracks and inspected the apparatus.

The King's Summer Palace at Sinaia.

During this time we were kept busy at the barracks, and had not much opportunity of seeing the city by daylight, except on Sunday, which is the gayest day of the week, and all the world and his wife drive in the Chausée, which extends out of the town about four miles. The buildings are of entirely modern construction, nearly all being put up within the last fifteen years, but some of them very fine; the oldest building of great size and importance being the king's palace, which is about 100 years old.

We began the official tests with a 60-kilometre trial between Ploesti and a place close to the barracks and aerodrome at Bucharest. Ploesti is a thriving oil centre, as one's sense of smell can soon detect. Signals were strong, and, considering the distance and the fact that we were working across the town, this was a very satisfactory test. Prince Carol, a son of the Crown Prince of Roumania, came to see the

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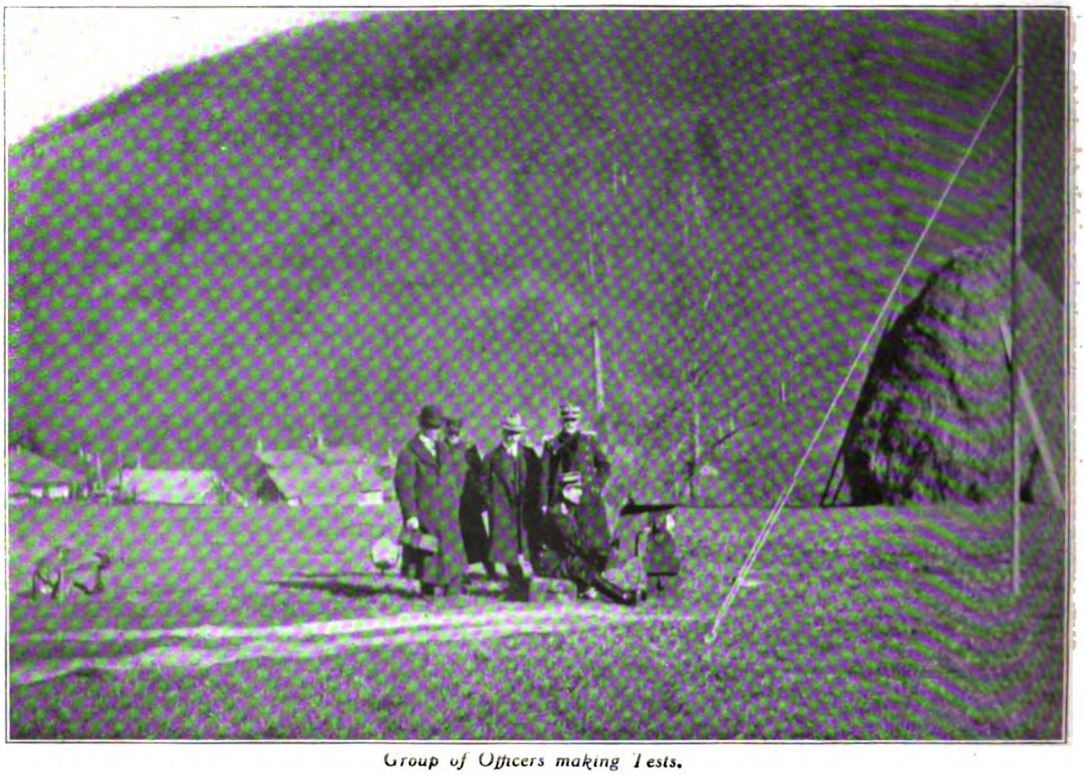
station, and appeared much interested, especially as Roumanian operators were working both ends. Later the station was dismantled, mounted on pack-horses, and taken back to the barracks. Next day the station was again erected close to the aerodrome, and we obtained good communication all the time. The army fully recognises the value of aeroplanes for scouting, and made good use of them in the recent manœuvres; the perfect weather now tempted some of their aviators, and we saw some good flights, the longest being 1¼ hours on a Blériot monoplane. The country is flat and ideal for flying, the landing being good almost everywhere.

The next test was between Ploesti and Chitila, which is 10 kilometres from Bucharest in the direction of Ploesti, so that the stations were closer by 10 kilometres than on the previous day; but another station, one of the three mentioned above, was put up at Bucharest to try to interfere with us. This attempt at interference failed, however, because, having only one wave-length to send on, while we had three, we could easily tune out the interfering signals.

The commission were very satisfied with these tests, but wished to ascertain what the Marconi stations could do working over mountains, in places where they had tried their own without great success. It was therefore arranged that one station should go to Sinaïa, and the other to Valeni de Munte. It is a long and weary journey from Bucharest to Sinaïa, as the train stops at every little wayside station, and crawls along through flat, monotonous fields, maize being the principal crop, now sere and yellow, as it was about three months after harvest. On nearing Sinaïa the features of the country abruptly change as the railway winds up through the Transylvanian Alps, the lower slopes of which are covered with pines, surmounted by bare and rugged peaks.



Group of Officers making Tests.

It did not appear a very promising place to erect a wireless station, and we had some difficulty in finding a site, and when we did it was in a narrow valley close under a mountain, the summit of which was nearly 3,000 feet above us. It appeared almost impossible to communicate with Valeni, 45 kilometres away, with so small a power as half a kilowatt over such difficult country. Signals, however, were

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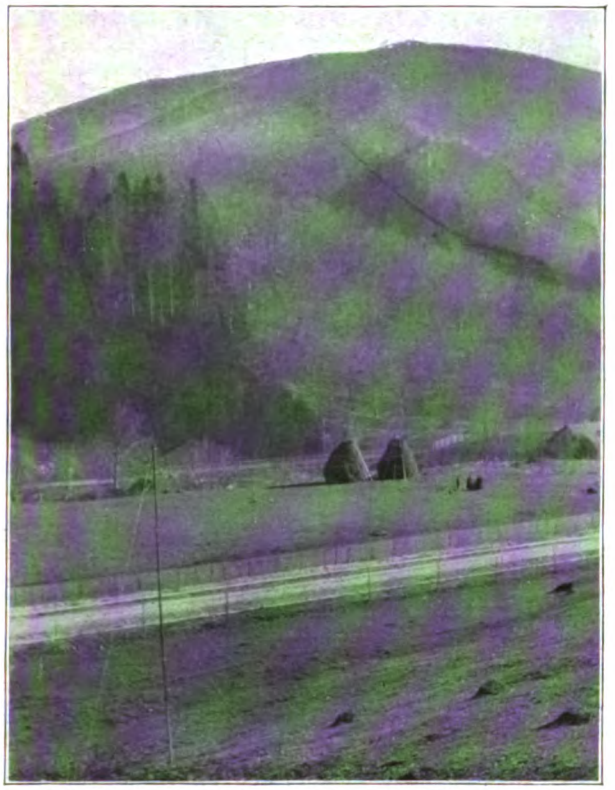
very good ; in fact, the Roumanian telegraphists sent and received a series of telegrams till the Commission said they were more than satisfied with a result which they thought hardly possible. This was the final test.

The King of Roumania has his summer palace at Sinaïa, and though he was in residence



The Station at Sinaia which shows the difficult country worked over.

at the time, we were able to go through the grounds, which are beautifully laid out. Great interest was evinced in the tests, which were of an exhaustive character, and which contributed yet another success to the credit of the Marconi field station sets.

Mr. E. J. Watts will leave for Shanghai on January 19th, taking with him two or three types of Marconi standard coast station sets, and on arrival there he will seek, with Messrs. Jardine Matheson, the Chinese agents of the Marconi Co., to whom Mr. Watts will be attached as expert, the permission of the Chinese Telegraph Administration to set up this plant at approved places for the purpose of demonstrating the latest Marconi practice.

Diary of Events.

1896.

February 7th.—Mr. Marconi arrived in England and conducted his first experiments in this country at Westbourne Park.

1900.

February 12nd.—Mr. Marconi delivered a discourse on wireless telegraphy at the Royal Institution.

1901.

February 12th. — Communication established between Niton station, St. Catherine's, Isle of Wight, and the Lizard, a distance of 196 miles.

The Marconi system of wireless telegraphy was largely used during the voyage of the Duke and Duchess of Cornwall and York to Australia.

1903.

February 2nd.—Messages from Cardinal Gibbons to Pope Leo XIII. sent from Cape Breton through Poldhu.

February 11th.—Agreement by Mr. Marconi with Italian Government for erection of a high power station in Italy.

1908.

February 3rd.—Marconi Transatlantic service opened to the general public for transmission of messages between United Kingdom and the principal towns in Canada.

COMPULSORY WIRELESS IN CANADA. —A law recently enacted at Ottawa provides that every sea-going and coast passenger ship of over 400 gross tonnage registered in Canada, and every sea-going and coasting freight ship having a gross tonnage of over 1,200 tons, shall be equipped with apparatus for wireless telegraphy. Failure to comply with the law subjects the offending owner to a fine ranging from $100 to $1,000, or to a term of imprisonment not exceeding twelve months, or both.

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The Marconi Wireless Telegraph Co. of America have arranged with the United States Weather Bureau that, in return for weather reports dispatched via steamers to the Weather Bureau, Washington, the vessels are to have the facility for receiving free of charge reports as to the weather conditions prevailing at the coast stations in the United States.

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Scientific Notes

THE MARCONI BENT TRANSMITTER.

The operation of the bent Marconi transmitter in wireless telegraphy forms the subject of a dissertation by Mr. Harold v. Hoerschelmann, which appeared in a recent number of our German contemporary, the *Jahrbuch der drahtlosen Telegraphie und Telephonie*. The subject is treated at great length, and with a mass of mathematical calculation which does not lend itself readily to abbreviation. The author shows that the efforts to concentrate all available energy for transmission in a certain direction led to the design of transmitting apparatus of two distinctive types. In the one, the attempt to use the difference of phase of various aerials situated at a distance from one another. Mr. Marconi, however, employed his bent transmitter, which consists of a vertical and of a much longer horizontal arm. With this arrangement Mr. Marconi has succeeded in covering great distances. As to whether this success is due simply to the fact that the direction of the radiation was one-sided, or whether it is partially due to favourable conditions, the author does not commit himself. But in his opinion the directional effect of bent transmitters over dry land has been established. The conditions governing the Marconi transmitter differ from others. In this case no distinction of the direction in a uniform medium could exist, because, as is well known, an oscillating bipole does not radiate any energy at all in the direction of its own axis, and, moreover, the horizontal arm of the transmitter is of no effect. But also in the case of perfect conductivity the directional effect would gradually become weaker, as the earth's surface is here to be taken as a mirror, so that only the effects of two similarly polarised bipoles of opposite phase, which are separated by a fractional wave-length, remain, which, in the oscillation direction, must cease almost completely, at least for distances which are great compared with the wave-length. This in itself leads the author to suppose that, for the effect of the Marconi transmitter, the finite conductivity of the earth must be of great importance, and the neglect to take this point into consideration explains the failure of experiments to obtain a theoretical solution of the problem.

UMBRELLA TYPE OF AERIAL.

An investigation of the operating characteristics of a wireless telegraph aerial was recently made at Cornell University, and the results are published in the *Electrical World* of New York. The experiments related to a determination of the factors affecting the design of the umbrella-type aerial, the investigation covering the effect produced upon the receiving efficiency by varying each of the following elements, the others remaining constant : Angle of inclination of antenna wires, length of antenna wires, wave-length of signals, number of antenna wires, and quality of signals. The first two tests were performed together in the following manner : The sending station was arranged to radiate energy in the form of electric waves at constant amperage and constant wave-length (the contact sending key being held down continuously during the whole of each run of approximately five minutes in order to have a steady, uninterrupted outflow of energy). At the receiving station the aerial was tuned for maximum reading of current received under varying conditions of length of antenna wires and angle of inclination of antenna wires with the vertical. A hand-level was used to obtain the readings of height h, and "current" readings were simply the square roots of ammeter deflections. The third and fourth tests were run in a manner very similar to that of the first two. The sending station was operated to give constant amperes radiation as in tests one and two, but the wave-length was varied for tests three and four. The receiving data were obtained in a similar manner to that for the first two tests, and the only difference was that a change was made in the variable elements. The receiving data taken May 22nd for 500 m. (1,640 ft.) wave-length served as a basis for correction of the observations of receiving current values in all other tests at the same wave-length, but under varying weather conditions. The fact that these other tests were made on different days and under widely different weather conditions made necessary the application of some correction to bring them all to the basis of weather conditions on one day. Hence, on May 22nd readings were taken at a constant value of the angle of inclination and at varying values of length ot antenna wires. It was found that six wires are sufficient in any case, and more than six will give only a very slight increase in receiving efficiency. The fact has been demonstrated that an aerial which is properly designed for high receiving efficiency will have high sending or radiating efficiency, while the converse is not necessarily true. For this reason only the receiving efficiency was considered in

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making the tests. The results showed that the value of β, the angle of inclination of the antenna wires, cannot be made over 75 deg. unless poles are used to support the outer ends of these wires. Curves were plotted, and these showed that if the angle β can be determined or assumed, a value of L/H (ratio of length of wires to height of towers) for maximum receiving current can be obtained from the curve by interpolation. Assuming, then, that $\beta =$ 65 deg. is to be used, the best results can be obtained by using wires 1.5 times as long, approximately, as their height above the ground at their inner ends. If poles are to be used, the authors believe that a value of $\beta = 90$ deg., approximately, should be obtained, and that in this case the longer the wires are the greater will be the receiving current within reasonable limits. An increase in length of wires means an increase in wave-length unless series capacity is introduced into the oscillating aerial circuit, and this is not desirable for several reasons, mainly because of lack of sensitiveness in tuning. The increase in wave-length in turn means a decrease in receiving currents, so that the increasing of length of wires if carried too far may cause a decrease instead of an increase of receiving currents. An important point which was not investigated in the series of tests is the effect of varying H, and this should be a simple and interesting point for future investigation. Experiments should also be made on the effect of variation of β from 0 deg. to 90 deg., and from 90 deg. to 180 deg. Further experiments on the effects of varying wave-length on the values of receiving currents would without doubt reveal some valuable information.

SCIENCE AND SPECULATION.

There is on record a well-known anecdote which may with profit be recalled at this moment: "The forerunners and rivals of Marconi no doubt knew of the eggs, but it was he who taught them to stand on end." This is brought to mind upon the belated reading of an interesting book, "La Physique Moderne, son Evolution," by Mr. Lucien Poincaré. There is in this book a chapter devoted to wireless telegraphy, and although some portions of it have by this date (four years after publication) been rendered rather antiquated by the settlement, for example, of the claims on priority, the historical portions can be read with profit. Mr. Poincaré has entered a strong vindication of the rights of Mr. Marconi. It cannot be denied, he said, that the young scholar (Mr. Marconi) brought a strictly personal contribution to the solution of the problem he proposed to himself. Apart from his forerunners, and when their attempts were almost unknown, Mr. Marconi had the very great merit of adroitly arranging the most favourable combination, and he was the first to succeed in obtaining practical results, while he showed that electric waves could be transmitted and received at enormous distances compared to those obtained before his day. This independent testimony deserves to be given the widest publicity, and should help to allay (if it has not already been done) the ridiculous comparisons that are made. When speaking of the propagation of a current in a material medium we do not forget the names of Fourier and of Ohm, who established by theoretical considerations the laws which preside over this propagation. When looking at the phenomena of induction we remember that Arago foresaw them, and that Michael Faraday discovered them. It would be rather a puerile taste to class men of genius in order of merit, or to search for a common denominator between, say, Marconi and Clerk Maxwell; mankind is indebted for its great progress to one as much as to the other.

Inauguration of Service by King of Spain.

THE Marconi Wireless Telegraph Co. have just completed a chain of stations in Spain, four of which have been already opened for public service—namely, the stations at Teneriffe, Las Palmas, Cadiz, and Barcelona. Three other stations are now complete—namely, Vigo, Soller, and Aranjuez. All these stations have given extremely good results and have completely satisfied the inspecting Commission appointed by the Spanish Government, with the result that His Majesty the King of Spain, on Saturday, January 27th, proceeded to Aranjuez to formally open the service for public use.

Aranjuez is situated in the centre of Spain, near Madrid, and is the central station for communicating with all the above-mentioned points in Spain where the other stations have been constructed, but it is also capable of communicating with England, and satisfactory trials were carried on during the inspection of this station with the station at Poldhu, in Cornwall. The King of Spain sent a marconigram to King George at Malta; the "Medina," on which vessel King George was voyaging, also being fitted with the Marconi system. The King of Spain also communicated with Queen Alexandra in England, and through the Marconi power station at Coltano, in Italy, with the King of Italy. The service was opened to the public on January 29th.

Land has been acquired at Chelmsford for the purpose of erecting additional works for Marconi's Wireless Telegraph Co. The erection of the factory is to be proceeded with at once.

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THE MARCONIGRAPH

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The Editor will be pleased to receive contributions; and Illustrated Articles will be particularly welcomed. All such as are accepted will be paid for.

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On the Rome Exchange.

The *Rome Official Gazette* of January 2nd published a Royal Decree authorising the quotation of the preference shares on the Stock Exchange of Marconi's Wireless Telegraph Co., Ltd.

The Share Market

The market in the various Marconi shares continued to be, during the past month, one of the most active features in the Stock Exchange. On January 9th, owing to the wild rumours that were circulated, the Ordinary shares touched 79s.

The managing director of Marconi's Wireless Telegraph Co., Ltd., influenced by the many inquiries from old-established shareholders, made a statement when interviewed by the Press which caused a sharp set-back in prices. The wild fluctuations at this time were caused by a clique of speculators, and the heavy shake-out resulting from the sudden fall has left the market on a much firmer basis.

During the present Stock Exchange account the price of the Ordinary shares has ranged from 65s. to 79s., and London brokers have had inquiries and purchasers from all parts of the world.

In the present month the Preference shares have reached $3\frac{3}{8}$.

The Canadian Company's shares have also been greatly in demand and show some advance.

Prices, January 25th:
Ordinary, $3\frac{13}{16}$
Preference, $3\frac{1}{4}$.
New shares, $1\frac{3}{4}$ prem.
Canadian, 19s.

A circular has been issued to holders of share warrants to bearer in Marconi's Wireless Telegraph Co., Ltd., intimating that an interim dividend for the half-year ending December 31st, 1911, on the capital paid up at that date on the 7 per cent. Cumulative Participating Preference Shares at the rate of 7 per cent. per annum will be paid on February 1st, 1912. An interim dividend for the half-year ending December 31st, 1911, on the capital paid up at that date on the Ordinary shares at the rate of 10 per cent. per annum will be paid on February 1st, 1912.

Coupon No. 4 of Share Warrants to bearer for 7 per cent. Cumulative Participating Preference shares, and Coupon No. 2 of Share Warrants to bearer for Ordinary shares may be lodged at the Head Office of the Company, Watergate House, York Buildings, Adelphi, London, W.C., and must be left four clear days for the purpose of examination and preparation of Dividend Warrants. The above-mentioned coupons may also be lodged with: La Banc, Commerciale Italiana, Milan, Rome or Genoa; La Banque d'Outremer, 48 rue de Namua Brussels; Marconi Wireless Telegraph Co. of America, Lords Court Building, 27 William

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Street, New York, U.S.A., and Mendl & Co., 383 Bartolomé Mitre, Buenos Aires, who will forward them to the Head Office of the Company in London for examination. All Dividend Warrants will be issued from the Head Office of the Company in exchange for the coupons received by them.

The necessary forms for lodging coupons may be obtained from any of the above addresses, or from Marconi's Wireless Telegraph Co., Ltd., Piazza San Silvestro, 74, Rome; La Compagnie Française Maritime et Coloniale de Télégraphie sans Fil, 35 Boulevard des Capucines, Paris, and The Marconi Wireless Telegraph Co. of Canada, Ltd., 86 Notre-Dame Street, Montreal.

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The remaining instalments in respect of the 187,500 Ordinary shares recently allotted to the shareholders in Marconi's Wireless Telegraph Co., Ltd., are payable as follows, to the London County & Westminster Bank, Ltd., 21 Lombard Street, London, E.C.:

Second instalment of 10s. per share, due February 1st, 1912.

Third instalment of 10s. per share, due April 1st, 1912.

Fourth instalment of 10s. per share, due June 1st, 1912.

The certificates in respect of the 187,500 Ordinary shares recently allotted to the shareholders are now ready, to be exchanged for the allotment letters, and may be obtained on application at the Registered Office of the Company. Italian shareholders must apply for their certificates to the bank through which they subscribed for their shares.

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The *Financial News* recently gave publicity to some statements concerning the Marconi situation contained in a private letter to clients issued by a Stock Exchange firm. The writers have been endeavouring to discover the cause of the recent buying, which in some quarters is said to be due to the progress of the negotiations with regard to the provision of the Imperial wireless system. In the opinion of the writers of the letter, this would be a very considerable factor in favour of the shares. Further on, the Stock Exchange firm from whose letter we have been quoting make the following observations: "We hear, on fairly reliable authority, that a certain amount of opposition is being encountered. As is perhaps known, the Admiralty have a greatly improved system of their own, and we hear they are urging that the Government should adopt their system in preference to that of Marconi's."

Statements such as the foregoing can only be based upon entire misapprehension. The system in use by the Admiralty is, in fact, the Marconi system adapted for long distance working, such as is not permissible in commercial wireless practice except over the Marconi Transatlantic service. It will be seen, therefore, that the Marconi Company are in an unassailable position in the matter.

The Patent Situation.

A STATEMENT, the common origin of which is unmistakable, has recently appeared in certain newspapers in Germany regarding negotiations which are said to be pending between the British postal authorities and Marconi's Wireless Telegraph Co., Ltd., regarding the formation of a radio-telegraphic All-British "world network." An ingenious attempt is made to develop a prejudice against an undertaking of the kind referred to on the ground that in the case of war England would be able to guarantee her telegraphic service against all possible attacks of an enemy. No reference is made, however, to the possible benefit which is likely to accrue to mankind by any scheme which will make accessible to telegraphic communication points which could not be reached at reasonable cost by any other means.

It is asserted in the same newspaper paragraphs that the representatives of the Telefunken system in England have commenced proceedings against the Marconi Company in England in respect of "the unauthorised use of one of Professor Braun's inventions."

Extracts from these German Press statements have reached some of our readers, who are naturally desirous of ascertaining the position of affairs. All we can say at this moment is that the question of the validity of the Braun patent may now be put to the test in the English courts. In our January issue we explained the patent situation, but in view of the numerous misrepresentations that have been circulated on the Continent it is desirable to make a further brief reference thereto.

On October 20th last the Marconi Company issued a writ against Messrs. Siemens Brothers and Co. for infringement of their patent No. 7777. On the following day it was determined to sue Messrs. Siemens in respect of infringement of another patent, and therefore a new writ was applied for, embracing both the four sevens patent and the other one. It being obviously useless to proceed with two actions for infringement of the same patent, the writ No. 1 was withdrawn, but the action for the infringement of the patent with which it dealt is continuing under the writ issued on October 21st.

Uruguay and Wireless.

The Uruguayan Government have issued a decree making it obligatory upon all passenger vessels trading with Uruguayan ports to be fitted with wireless installations. This law becomes effective on May 1st. As a penalty all vessels not complying with the decree will be refused despatch by the authorities.

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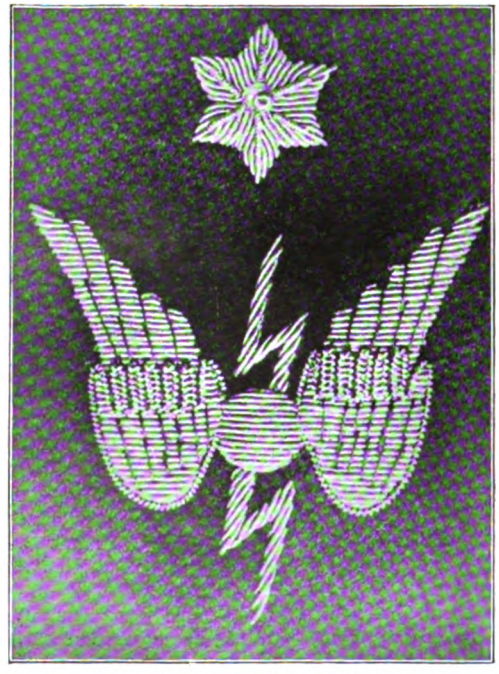
Wireless Telegraphy for Naval Purposes

By Mr. H. CLIFFORD STROUD

[Abstract of a paper read before the Graduates' section of the North-East Coast Institution of Engineers and Shipbuilders at Newcastle-on-Tyne, on January 13th.]

THE science of wireless telegraphy is one which has been exceedingly rapid in its development. The existence of ether waves was discovered by Hertz in 1888, but it was not until nine years later that the subject was brought prominently before the public notice by Marconi, and then only in a very primitive form. In the year 1899, however, he succeeded in communicating between Dover and Boulogne, and so one may say that the practical developments date from the beginning of the twentieth century. At the present day even the smallest craft in the British Navy is equipped with a wireless installation, and passenger liners, as well as a great number of merchant vessels, are fitted. The influence of this upon modern developments has, of course, been enormous, and to the Navy wireless telegraphy is now absolutely indispensable.



Badge worn by Wireless Telegraphists in the Navy.

At the present time when crossing the Atlantic one is never out of communication with land, and the passengers have issued to them the equivalent of newspapers, giving them the news of the world as soon as, or even sooner than, we read it in our morning papers.

The transmission of electric signals through the ether without the use of wires is effected by means of electric waves or oscillations, and we must consider (1) the generator of these ether waves, (2) the aerial which gives them the necessary send-off—*i.e.*, the radiator of the waves—and the similar structure for collecting them at the receiving station, and (3) the apparatus which detects the waves and makes the signals readable.

To commence with the generator of the electric oscillations, the first arrangement for their production was by means of the ordinary Leyden jar, or condenser, which consists essentially of two metal plates separated by some substance which does not allow an electric charge on one plate to discharge to the other. If the one plate is charged to a high potential with regard to the other, by means of an induction coil or otherwise, and then allowed to discharge itself suddenly through a spark-gap in the connection between the plates, it can be seen by means of revolving mirrors that what appears to the eye to be a single spark is in reality a series of sparks. This is explained by the fact that the discharge overshoots the mark, or gives up too much of its charge, whereupon there is another spark in the reverse direction, which process occurs several times for each apparent spark.

The electric capacity of the condenser is large, the inductance of the discharge circuit is small. Now the time of oscillation of an electric discharge depends on both the capacity and the inductance; and in the ordinary units of measurement if

t is the time of oscillation,
C the capacity,
L the inductance,
then $t = 2\pi\sqrt{CL}$,

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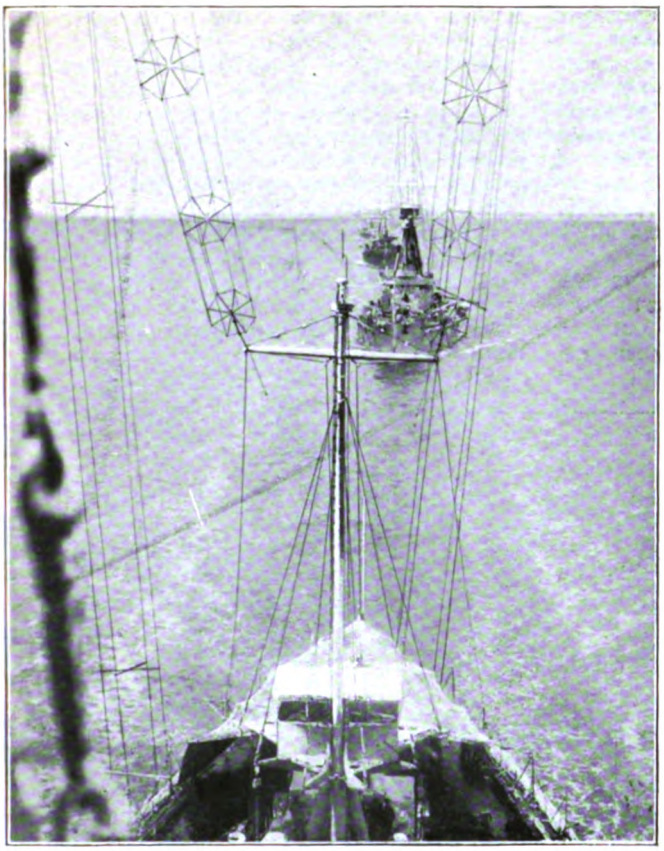

View of the Aerials of the Home Fleet at Sea.

and the frequency of the discharge (or the number of oscillations per second).

$$\eta = \frac{1}{2\pi\sqrt{CL}}.$$

The arrangement of the coil, condenser and spark-gap circuit is that commonly called the "closed oscillator." In it very little of the energy stored in the condenser is radiated, and so for the purpose of setting up oscillations in the ether it is useless. The simplest type of oscillator which is at the same time a good radiator is the "open oscillator." In its essential form it consists of a spark-gap with two wings of wire in the same straight line. The spark-gap is connected to the terminals of an induction coil. In such an arrangement there is no concentration of the lines of force—as is the case with the Leyden jar—and consequently the energy is rapidly radiated. The energy passes off in the form of electro-magnetic waves, which travel on indefinitely in the ether in all directions. It was with such apparatus that the first experiments in wave telegraphy were performed.

For laboratory experiments this is all that is required, but to transmit signals any distance it was found to be inadequate. In the first place, the length of the wings would have to be enormous to radiate the energy required to send any appreciable distance. The first improvement was to turn this oscillator on end, so to speak—*i.e.*, erect a long vertical wire with a spark-gap at the bottom, the other wing being cut short and connected to earth.

This was called the plain or Marconi sender. It has many latent disadvantages, however, the chief being that the capacity of this antenna or aerial must necessarily be small, and as the energy in the antenna is limited by its capacity and the length of the spark-gap—which cannot conveniently exceed half an inch—the radiation is bound to be rather small.

The improvement in wireless-sending apparatus which made long distance work a practical possibility was the introduction of what is called the "coupled circuits." The spark circuit is separated from the antenna, and a large amount of capacity is put into it, thereby obtaining great concentration of the energy with, at the same time, a small spark-gap.

The actual arrangement consists in connecting the aerial wire to a coil placed at the foot, forming an inductance, and thence to earth. Another coil is placed in close proximity to this, and contains the spark-gap and a condenser in circuit with it. These two circuits are called coupled circuits. The period of oscillation of the antenna circuit is arranged to be exactly the same as that of the condenser and spark-gap circuit.

This is the general elementary form of spark sender as in use at the present time. One modification is, however, sometimes made, and that is to make part of the inductance of the coupled circuits common to both.

The next thing is to understand the apparatus used for receiving the waves transmitted through the ether. As far as the circuits are concerned, there is no great difference between the sending and receiving, but, instead of setting up oscillations by means of a spark

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across a spark-gap, an instrument to intercept the minute oscillatory currents in the antenna flowing to earth must be suitably placed. A detector in common use is Marconi's magnetic receiver. (An example of the latter was presented by the Marconi's Wireless Telegraph Co. to the Physical Department of Armstrong College, Newcastle-on-Tyne.) This form of detector is used almost universally for naval purposes on account of its extreme reliability. The Marconi Co. provide all the ships they fit up with this form.

Another form which has recently come into general use is the Marconi-Fleming oscillation valve detector. This depends on the fact that when electric oscillations are arranged to pass between an incandescent metal filament (tungsten is now used) in the ordinary vacuum bulb, and a plate or cylinder sealed into the bulb, it acts like a non-return valve, only allowing the current in one direction to pass from the plate to the filament. In this form, as in all other modern forms of detector, a telephone is used to make these currents audible.

The next point of importance is the antenna or aerial wire. This is actually of the greatest importance, as in wireless telegraphy everything depends on the send-off which the waves are given by its means. The antenna may be one of many varieties, and in many cases its shape depends not upon what would be the most efficient as upon ease of erection. To take a ship as an example, it would be impossible to erect an antenna of the umbrella type, but the antenna must be stretched between the masts. On land, however, these restrictions are to a large extent non-existent; and for land purposes there are umbrella, fan-shaped, cone, and many other varieties of antenna.

The earliest form of antenna was simply a long vertical wire supported by a mast, the idea being to reach as great a height as possible. In the modern forms there is a long vertical wire leading up to the main part of the antenna, and at the top the wires are arranged as circumstances permit, or, if there is any option, in the way which seems to be the most suitable. The umbrella-shaped antenna is, as its name implies, made in the form of the ribs and periphery of an umbrella.

In the design of an aerial the chief point is to get as much capacity as possible at the top, in order to give the waves a good send-off. On ships the support for the antenna must obviously be the masts, and so the shape is in general either T-shaped or inverted L-shaped, depending on whether the operating cabin is amidships or towards the bow or stern. The top part is usually made of six or eight wires held apart by cross-pieces, and in the form of a long cylinder, this is supported by porcelain insulators from the two masts, and two or more wires descend from it to the operating

Submarine D 1 and Wireless Mast.

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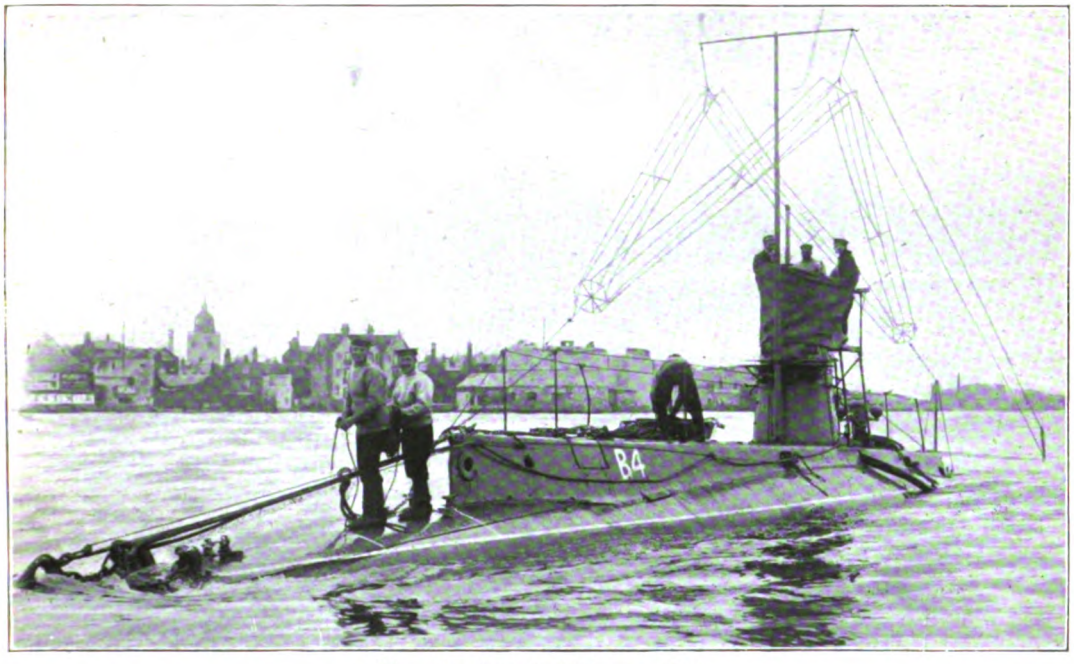
cabin through suitable insulation. This is the form of antenna usually seen on passenger boats equipped with wireless. There are, of course, modifications to suit the individual requirements of vessels, but in general construction they are much the same.

When the vessel had only one mast, as in the case of destroyers, submarines and some battleships, the form adopted is that of an inverted V, the antenna being stretched between erections at the bow and stern and supported by the mast in the middle.

It may be thought that the establishment of communication between two stations is dependent on having no obstruction in the direct line between the two antennæ. That this is not the case can be shown by a simple calculation. Let us suppose the two stations to be 3,000 miles apart, as for Transatlantic communication. The radius of the earth being taken as 4,000 miles, the heights to which the antenna would have to be erected would be about 330 miles. If this height had to be attained for communication over 3,000 miles, clearly wireless telegraphy would not advance very rapidly. This calculation, however, serves to show that the path of the waves is not in a straight line between the two stations, but must follow the circumference of the earth.

To have a good earth connection is of the very greatest importance, and this is, of course, very easy to obtain on board ship, all that is required being to connect to the hull of the vessel, which is in intimate contact with the sea, itself the best of earths. As this paper is intended primarily for the discussion of wireless telegraphy for naval purposes, I shall not enter into the question of earth connections for land stations, which is in itself a very wide subject.

In discussing the question of sending apparatus, it was seen that the frequency of the electric oscillations set up by a given circuit is determined by the formula $t = 2\pi\sqrt{CL}$—*i.e.*, knowing the capacity and the inductance in the circuit the time of vibration is determined.



The Aerial of the Submarine B 4.

In this way the circuit can be tuned to any given note by varying either the capacity or the inductance of the circuit or both. The waves sent out from any oscillator travel on indefinitely in the ether until they strike some earth connected conductor, and if this aerial (in our case) is tuned to the same frequency—*i.e.*, has the same wave-length—as that of these ether waves, this circuit will take up the oscillations in the same way as one tuning fork will respond to another of the same note, which has been made to vibrate. If, however, the aerial which intercepts the waves is not of the same frequency, the effect will be very greatly reduced, since it

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will only respond intermittently to the waves impinging on it.

The wave-lengths used in practice are as follows: the ordinary commercial wave-length for ships is 600 metres, which has a frequency of half a million oscillations per second. Between 600 and 1,600 metres is reserved by the Admiralty for warships in the British Navy, and for Transatlantic work such wave-lengths as 2,000, 4,000 metres, or even greater, are used. The Marconi station sends constantly with 6,000 metre wave-lengths at their Transatlantic station at Clifden, on the west coast of Ireland, sending to Glace Bay, Nova Scotia. It is found that for the same power messages can be sent longer distances with big wave-lengths than with small ones.

In a sending apparatus there is necessarily an interaction between the two coupled circuits. The primary circuit—*i.e.*, the one containing the spark-gap—sets up oscillations in the secondary circuit containing the antenna, and then the secondary reacts with the primary. This phenomenon can be demonstrated by suspending two similar pendula from a flexible support. If one is set swinging it transfers its energy to the other, which starts to swing, and in doing so stops itself; the second then starts the first in the same way, and so the energy is alternately transferred from one to the other. If the support is very flexible, corresponding to close coupling, two periods of vibrations are obtained; if, however, the support is less flexible, corresponding to looser coupling, the two periods become more nearly identical.

It is thus seen that the wave-length of the radiated waves consists of two components, one of which has a greater wave-length than that to which both are tuned, and the other smaller. Thus the total energy that is radiated is divided between the two wave-lengths, and neither is the same as that to which the coupled circuits are separately tuned. This is largely overcome by weakening the coupling. To overcome this difficulty Mr. Marconi has adopted the quench spark.

If the spark-gap consists of very short sparks between cooled discs there is very large damping effect. By this method the primary oscillations are quenched by the damping after but one or two swings, and the secondary circuit continues to oscillate in a single period even with fairly close coupling, which, of course, gives rise to a wave of definite wave-length. In the development of this system a very large number of discharges are produced per second, and thus one very great advantage is obtained in the musical note produced in the telephone at the receiving station, which

A Group of Naval Wireless Telegraphists.

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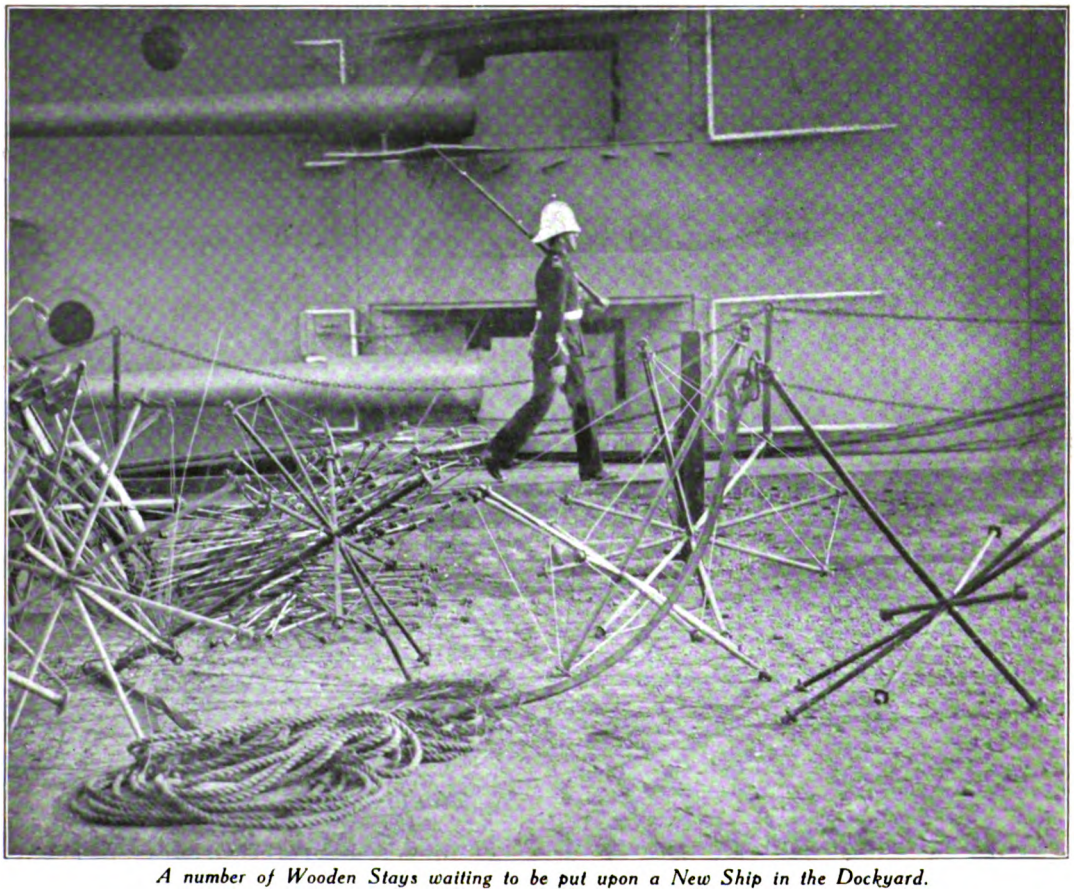
is distinctive of the station transmitting, and is never confused by the operator with ordinary atmospheric disturbances.

Having thus dealt with the principles of wave telegraphy and the apparatus used for practical work, let us turn our attention to the purposes for which the science is used, and also those for which in the future it is hoped to be used. The foremost of these is the now almost universal fitting of passenger liners with wireless apparatus, so that at all stages of the voyage the ship is in continual communication with the shore and with other vessels at sea. This is so complete that on big liners a daily bulletin of the world's news is published.

The fact that already upwards of 3,000 lives have been saved at sea by the establishment of wireless communication is quite sufficient to show how extraordinarily useful a wireless installation can be on a ship. The use of wireless also for naval purposes is now universal, every ship in the British Navy being equipped. The Admiralty has an antenna and station above the building at Whitehall, by means of which the movements of the Fleet can be controlled without any delay whatever. Even submarines are fitted.

An application of wireless telegraphy which it is probable will develop greatly in the near future is the "Radio-telegraphic Compass." For this a directive antenna is used—*i.e.*, one by means of which signals can be sent in any desired direction, and also by means of it the direction from which any signals come can be determined. A certain number of fixed stations send out distinctive signals at intervals, the ship receives these signals, and thus its position is accurately determined. It is as yet only in its experimental stages, but, I am told, the company promoting the idea offers to fit vessels. It can readily be seen that such a method for determining the position of a ship would be extremely useful.

The photographs from which the illustrations used in this article are made were taken by Mr. Stephen Cribb, of Southsea.



A number of Wooden Stays waiting to be put upon a New Ship in the Dockyard.

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Some Unique Applications of Wireless.

THE Compagnie de Télégraphie Sans Fil, who are the licensees of the Marconi patents in several countries on the Continent, have recently been doing or have contracted for installations which are somewhat unique, and therefore deserve special mention, inasmuch as they provide still another proof of the remarkable versatility of wireless telegraphy. Among some of the work which this Company have either completed or which they have in hand are the equipment of a training ship, a floating whale factory, a submarine, etc.

"L'Avenir," which is the training ship referred to, is the Belgian training ship for cadets in the mercantile marine. The wireless set is of the standard 1½ kw. type, but the erection of the aerial was an interesting problem on account of the somewhat complicated rigging. A dummy aerial was first erected, this being made of codline, and adjusted to have the best arrangement possible without fouling the rigging. It was then hauled down and reproduced in phosphor bronze. A school for the training of wireless telegraphists fitted with the necessary instruments has also been arranged on this vessel. The instructor in wireless to the cadets is Mr. A. V. P. Maernoudt, one of the senior members of the staff of the Compagnie de Télégraphie Sans Fil. Mr. Maernoudt is also officer in charge of the station.

Another unique and important installation is that of a floating whale factory. The ss. "Falkland," belonging to Mr. H. Fredriksen, of Toensberg in Norway, has just left for the Antarctic Ocean, where she will be engaged in the whaling industry. The "Falkland" is fitted up as a floating factory. In actual work this ship will remain the base for the smaller boats which are sent out harpooning, and the whales that are caught will be towed back to the "Falkland" for blubber and whalebone extraction. The "Falkland" has been fitted with the standard Marconi 1½ kw. set, and the operator on board, who has charge of this installation, will doubtless have

Belgian Training Ship "L'Avenir," which has been fitted with Wireless.

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many interesting experiences to relate on his return, which we hope to publish in due course in THE MARCONIGRAPH.

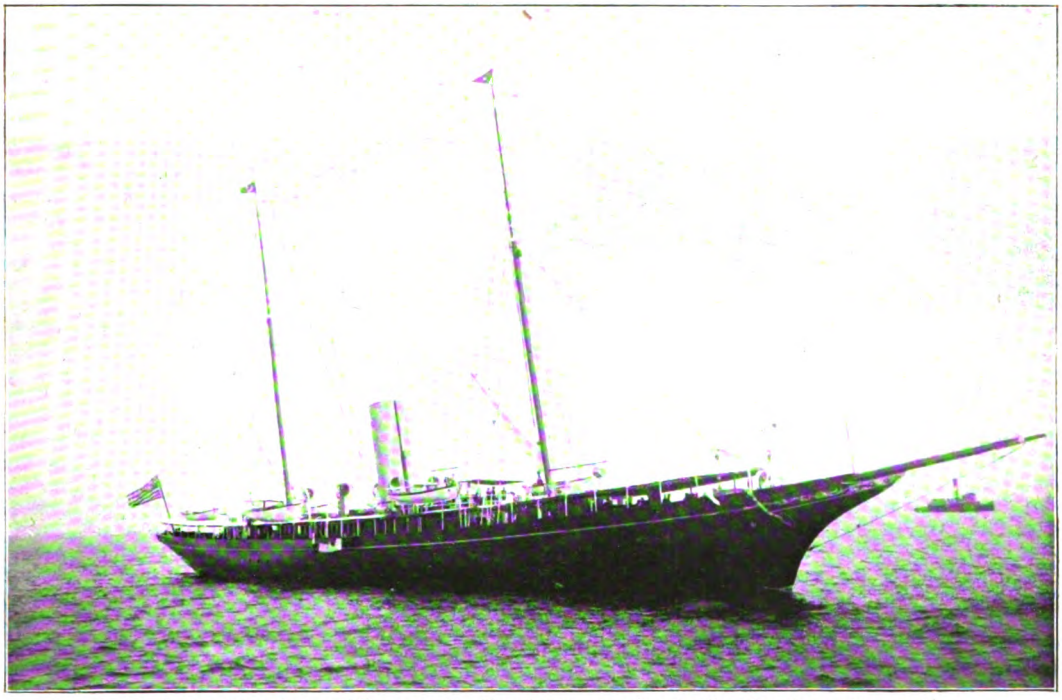
It is a far cry from a whaling ship to a salvage tug, yet the Compagnie de Télégraphie Sans Fil have no hesitation in carrying out any class of work. This Company have just entered into a contract with Messrs. L. Smit & Co. (Sleepdienst), of Rotterdam, for the equipment of the "Roode Zee," a fine salvage tug, with a complete Marconi standard 1½ kw. set. The owners propose to issue directions by wireless direct to the vessel, which is more often on patrol than stationed, to proceed from wherever she may be to any vessel in distress or requiring assistance.

A ½ kw. installation for the submarine "Kobben" ordered by the Norwegian Naval Department from the Compagnie de Télégraphie Sans Fil is of special design and extremely compact plant. For the Royal Observatory Authorities at Uccle the same Company have been instructed to supply and erect apparatus at the two best points of observation in Belgium during the eclipse of the sun in April next, so that the astronomers may be able to receive reports from other centres.

These few items chosen at random from amongst the work which has recently been placed with our Belgian friends stand, not merely as a tribute to the enterprise and efficiency of that Company, but are also an evidence of the extreme importance and utility of wireless telegraphy.

American Notes.

AN interesting installation of wireless telegraphic apparatus is that on Mr. J. Pierpont Morgan's steam yacht "Corsair," which is about to be equipped with a 25 k.w. set by the Marconi Wireless Telegraph Co. of America. The Matson Navigation Co. have also placed orders with the same Company for the equipment of the following steamships: "Lurline," "Wilhelmina," "Hyades," "Helonian," and "Enterprise." Each of these steamers is being equipped at San Francisco with 3 k.w. Marconi sets. The s.s. "Portland" and the s.s. "Louis Lucenbach" of the California-Atlantic Steamship Co. are also being fitted with 3 k.w. sets, and will be engaged in the trade between New York and San Francisco. It is interesting to note that six other boats of this line will be equipped at San Francisco in the near future.



Mr. J. P. Morgan's Yacht "Corsair." Fitted with Wireless by the American Marconi Co.

The land station at San Francisco is now in operation and is doing some remarkable distances. It is expected that the station to be located at San Diego, California, will be in operation early in February, and the one at Seattle, Washington, shortly after. These stations operate from 60 cycle A.C. mains using open-core resonance transformers operating at 90 per cent. power factor with 5 k.w. disc transmitters, the discs being driven by alternating current motors. A valve tuner of the latest type is used on the receiving end.

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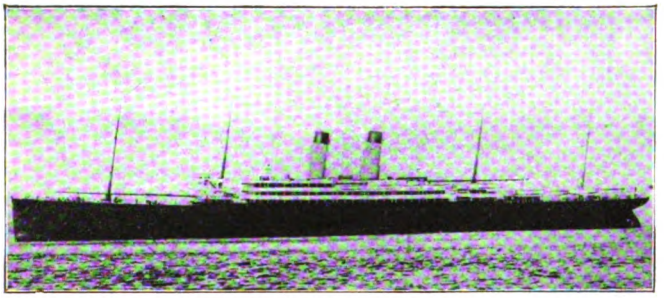
Maritime Wireless Telegraphy

A GLANCE over the lists of wireless communications made by vessels afloat furnishes instructive reading, as the list given below testifies. The wireless communications referred to here were made by the White Star s.s. "Cedric," remaining in touch with shore stations every day from Liverpool to New York between September 28th and October 7th, 1911. Since December, 1910, the "Cedric" has been fitted with the Marconi standard 1½ k.w. sets, and has on several occasions signalled 1,500 miles over the North Atlantic. The receiving set is magnetic, and the transmitting power-meters show 70 volts and 26 amps A.C. The following is an extract from the log of the "Cedric":



R.M.S. "Cedric."

1911.

Sept. 28th.—In communication with Liverpool all day.

Sept. 29th.—In communication with Crookhaven all day.

Sept. 29th.—12.40 a.m., signalled Scheveningen Haven, 315 miles.

Sept. 29th.—1.50 a.m., signalled Pola, Austria, 930 miles.

Sept. 29th.—9.20 p.m., signalled Scheveningen Haven, 600 miles.

Sept. 30th.—12.20 a.m., signalled St. Marie-de-la-Mer, 920 miles.

Sept. 30th.—1.11 a.m., signalled Seaforth, Liverpool, 400 miles.

Sept. 30th.—2.40 a.m., signalled Scheveningen Haven, 705 miles.

Sept. 30th.—10.39 p.m., signalled Seaforth, Liverpool, 800 miles. Sent messages.

Oct. 1st.—3.20 a.m., signalled Seaforth, Liverpool, 890 miles.

Oct. 1st.—9.30 p.m., signalled s.s. "Cameronia," 1,000 miles.

Oct. 2nd.—1.40 a.m., signalled Cape Race, 900 miles. Sent messages.

Oct. 2nd.—2 a.m., signalled Seaforth, Liverpool, 1,250 miles.

Oct. 2nd.—7.45 p.m., signalled Cape Race, 550 miles. Sent messages.

Oct. 3rd.—In communication with Cape Race all day.

Oct. 3rd.—11.59 p.m., in communication with s.s. "Kaiser Wilhelm II," eastbound, and remained in touch until 8.50 p.m. on Oct. 5th, making over 1,000 miles ahead and astern. "Kaiser" says "We cannot get out of your range."

Oct. 4th.—In communication with Cape Race and Sable Island all day.

Oct. 5th.—In communication with Sable Island and Cape Sable all day.

Oct. 6th.—In communication with Cape Sable, Siasconsett, Sagaponack, Cape May, Seagate, all day.

Oct. 7th.—In communication with Seagate. Docked 8 a.m.

On October 2nd the "Cedric" was in communication with both Cape Race and Seaforth together; the signals from both stations were very good, the total distance covered from Cape Race to Seaforth being 2,190 miles.

✦

Four gunboats are now being built in France, and Marconi's Wireless Telegraph Co. have received an order to equip these vessels with wireless telegraph apparatus.

✦

An interesting feature of the uses of wireless telegraphy in the maritime world is its application to fishing vessels. Many of the vessels engaged in the Newfoundland Seal Fishery are equipped with Marconi apparatus, the latest of these vessels to be so equipped being the "Nascopie" for Messrs. Job Bros.

✦

The heavy list of shipping disasters notified during the past month plainly indicates that shipowners can no longer afford the risk of

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sending out their cargo vessels without the increased protection afforded by equipments for wireless telegraphy. Mishaps will happen no matter what precautions are taken, because of the impossibility of abating the fury of the storms on the high seas. But, as has been frequently demonstrated, a vessel fitted with wireless can to her advantage obtain telegraphic information as to the state of the weather ahead ; while in the event of a mishap aid can be summoned from all vessels within range of the disabled vessel's wireless instruments, and in a great many cases communication may be established with the shore, and further help sent out. No one can view the long list of shipping casualties that occurred during the past month without a shudder, and one is prompted to wonder in how many cases the resultant damage would have been less, or the fatalities fewer, had wireless telegraphy apparatus been installed on all the boats.

It is stated that the American Government have allocated seven million dollars towards the equipment of 50,000 American fishing vessels with wireless telegraphic apparatus, and the erection of a coast station. This step has been necessitated by the frequency of the disasters which befall fishing craft while on the high seas, and it is felt that the equipment of all the boats with standard apparatus will considerably reduce the risk of loss.

During the Christmas trip of the " Lusitania," which, by the way, added another to the magnificent records which stand to the credit of the famous Cunard liners, friends of the passengers on board were kept in continuous touch with the vessel by means of wireless telegraphy. The vessel attempted to make the outward and homeward journey in record time. When considering the wonderful achievements of these fast vessels, it is worth bearing in mind how much is due to wireless telegraphy, for, by ordering stores, etc., for the return journey when on the high seas, it is possible for everything to be ready when the vessels arrive in port. The " Lusitania " was greatly helped in her record-breaking voyages across the Atlantic by wireless telegraphy. While travelling westwards, 6,000 pounds of meat, 4,000 pounds of fish, 3,600 quarts of ice cream and other stores were ordered by wireless telegraphy.

A wireless message from a passing steamer to the Tongue Lightship stated that a four-masted steamer was ashore, and asking for a tug and lifeboat at once. A lifeboat proceeded to a tug, which towed the lifeboat up Channel. The lifeboat returned at 1.10 a.m., and reported that a large four-masted steamer came off the shingle just as they reached the vessel.

The Compagnie de Télégraphie Sans Fil, of Brussels, acting under instructions received from Messrs. The Rederiaktiebolaget St. George (Wilson & Co.), of Gothenburg, have equipped the steamer " St. Paul " with a Marconi 1½-kw. installation. The Rederiaktiebolaget St. George have thus the credit of being the first shipping company in Sweden to adopt wireless telegraphy, and it is instructive to know that the " St. Paul " is engaged in the coal trade between Sunderland and Gothenburg, and with the addition of wireless telegraphy to her other modern equipments she is now to be ranked amongst the most up-to-date steamers of her class.

The rescue on January 11th of seven hands from the wrecked German brigantine " Falke," which stranded during a fog on the Cross Sands near Yarmouth, was due to wireless telegraphy. The Cross Sands Lightship sent a message to Caister, which brought out the lifeboat. She anchored fifteen yards from the wreck, and one hand was dragged through the sea into the lifeboat, when a big sea broke the anchor cables and drove the lifeboat alongside the wreck, when six other hands jumped on board. The lifeboat not only lost anchors, but sustained so much damage that she became leaky on the return trip to her station. The " Falke " was bound to Yarmouth from Bremen with a cargo of rice.

The following are amongst the ships fitted with Marconi standard 1½-k.w. and emergency plants for the Marconi International Marine Communication Co. during the past month : " California " and " Caledonia " (the Anchor Line), " Princess Patricia " (the C.P. Railway Co.), " Bruce " (Reid Newfoundland Co.), " Turakina " (New Zealand Shipping Co.). The following vessels are now being equipped : " Ramos " (the Amazon Cable Co.) and " Huallaga " (Peruvian Steamship Co.). The company have also received instructions to equip the following vessels : " Talune " and " Manapouri " (Union Steamship Co. of N.Z.), " Narrung," " Wilcannia," " Wakool," " Commonwealth," and " Geelong " (the Peninsular and Oriental Co.), " Arlanza," " Descado," " Demerara," " Desna," " Deveron," and " Drina " (the Royal Mail Steam Packet Co.), " El Paraguayo," " La Rosarina," and " El Uruguayo " (Birt, Potter & Hughes). Four steamships are to be fitted for Elders and Fyffes, Ltd.

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Benevolence

A further sum of £3 1s. 6d. has been collected by Mr. F. E. D. Pereira in aid of the fund raised on behalf of Mrs. McIntyre, making, with the amount sent on a previous occasion, a total of £6 11s. 6d. raised in Liverpool. The following have subscribed towards this amount:

W. G. Martin
F. Jones
S. Stansbridge
G. W. Balfour
R. Huckvale
S. H. V. Abbott
E. N. Barnwell
W. Davies
C. W. Perkin
A. G. Blow
W. D. Lacey
R. Leith
W. A. Woodhouse
H. James
F. White
J. Bamford
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R. A. C. Lee
P. Doherty
James Gill
H. Cox
E. E. Learman
H. S. Bride
H. Gibsone
C. M. Allnutt
W. Franklyn
J. S. Smith
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W. Platt
H. F. J. Merton
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G. McCormack
J. Starkey
W. Groves
C. Searl
L. Smith
W. Silvester
E. J. Day
J. Connell
H. Munro
S. Smith
R. Atkinson
H. J. Redgate
C. Sandbach
S. W. Brown
F. Milford
F. Garwood
W. P. Marshall

A sum of 5s. has also reached us from Mr. F. S. Dennis. Mr. P. Lepancois, of Algiers, has also sent 3s. 4d.

Movements of Operators

W. Raw, from the "Celtic" to the "Manco."
J. W. Boadella, from the "Runic" to the "Laconia."
C. H. Whitaker, from the "Manco" to the "Runic."
J. P. Skinner, from the "Ultonia" to the "California."
J. A. Pritchard, from the "Empress of Britain" to the "Ultonia."
S. W. Lewis, from the "Ortega" to the "Celtic."
S. McLeod, from the Marconi School to the "Arabic."
E. J. Trail, from the "Winifredian" to the "Cestrian."
G. J. Wright, from the "Cestrian" to the "Dunvegan Castle."
W. Syme, from the "Saxonia" to the "Ausonia."
A. C. Baker, from the "Arabic" to the "Winifredian."
S. H. Adames, from the "Campania" to the "Dover Castle."
A. E. Greenslade, from the "Guelph" to the "Gloucester Castle."
J. M. Simmons, from the "Lusitania" to the "Moldavia."
A. B. Bower, from the "Marmora" to the "Demosthenes."
H. Hayes, from the "Kenilworth Castle" to the "Montfort."
F. White, from the "Antony" to the "China."
P. Doherty, from the "Laurentic" to the "Laconia."
D. Sutherland, from the "Gloucester Castle" to the "Cameronia."
F. Jeffries, from the "Mongolian" to the "Cassandra."
H. D. Humphries, from the "California" to the "Titonia."
T. G. Petersen, from the "Cretic" to the "Egypt."
F. Beatson, from the "Carisbrook Castle" to the "Marmora."
G. P. Wakeling, from the "Saturnia" to the "Orsova."

Movements of Engineers

F. S. Stacey has left Poldhu to join the technical staff at the London office, and B. Pontifex takes his place as officer-in-charge of Poldhu Station.

W. S. Entwistle and C. S. Franklin have returned to London from Coltano.

H. Caswall, having completed the tests of the Varna Station, has gone to Glace Bay, Nova Scotia.

R. N. Vyvyan has returned to London from Madrid.

C. C. Chapman and P. Croaker have returned from Spain. The former is now at Poldhu in readiness to proceed to Brazil, and the latter is in the London office.

F. E. Burrowes sailed for the Falkland Islands on January 11th.

E. J. Watts has sailed for China.

J. H. Meyer is returning to England on account of ill-health, and J. Raebel has sailed for Borneo to take his place.

Movements of Engineers in the American Co.

A. H. Ginman has been placed in charge of the Pacific Coast Department.

R. H. Sawler is now in charge of the Seattle, Washington, office.

Movements of Operators in the American Co.

J. H. Sellars has been transferred from the "Grenada" to the "Portland."

Jack R. Irwin has been placed in charge of the Philadelphia Wanamaker Station.

C. M. Daniels has been transferred from the "Rosalind" to the "Grenada."

A. J. Gardner has been appointed to the Siasconset Station.

J. Cowden has been placed in charge of the Siasconset Station.

Personal

Mr. F. Jones, formerly Instructor in the Liverpool School, has been appointed Residential Inspector in Glasgow.

Messrs. Jardine, Matheson & Co., of Hong-Kong, Shanghai and Yokohama, have been appointed the agents of the Marconi Company and the International Marine Communication Company in China and Japan.

Obituary

We regret to record the death, on January 12, of Mr. H. Dilliway, a member of the secretarial staff of the Marconi Wireless Telegraph Co. Mr. Dilliway had been suffering from consumption for a long time.

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THE MARCONIGRAPH

No. 12. March, 1912. Subscription, 3/- per annum, post free. Price 2d. Post Free 3d.

The Early Critics of Wireless

IT is almost superfluous to declare that anyone who attempts to forecast the future of an invention, and who thereby seeks to influence public opinion, should be possessed not merely of a knowledge of its principles, and of the factors bearing upon them, but that he should be absolutely devoid of prejudice so that he can illumine the obscure and uncertain promises of that discovery by the rays of an open mind. Unfortunately for the prognosticators of evil for wireless telegraphy their forecasts were not always based upon knowledge tempered by impartiality, and their outpourings, viewed in the light of modern achievements, seem to afford material for nothing but ridicule. In perusing the pages of an old magazine we alighted upon an article dated July 1st, 1909, in which the writer set out to discuss long-distance telegraphy. The impression conveyed by reading the observations concerning wireless telegraphy was that the writer had less faith in his convictions than in the vulnerability of his arguments, and the only wisdom which he showed was in withholding his name from the article in question.

"The great problem with the early inventors of the telegraph," he said, "was 'how to tie the current to a wire'; but the problem with the wireless people is how to let it loose, so that it may career over the face of the globe for anyone to catch hold of!" He magnanimously conceded that the system had undoubted advantages at sea, but then, "any ship within radius may help itself to the messages knocking about; and, although this was a mercy in the case of the wreck of the 'Republic,' it might be far otherwise in the case of ships of war at close quarters with the enemy." No doubt the reason why every navy worthy of the name is equipped with wireless telegraph apparatus is the desire to cultivate espionage in a new form.

But the massive imagination of our prophet has discovered one use for wireless telegraphy. "American millionaires have set up costly installations along the coast, near New York, as playthings for their sons, and to such an extent has the nuisance grown that legislation has been demanded to put a stop to it."

The fallacies collected by the writer of the article prove to his mind "what has been foreseen by practical telegraphists from the first, that the more the system is extended the less efficient it becomes; and if to this we add that it lacks the great essentials of speed, security and secrecy we shall see that it can never become of any real value for commercial purposes, although it may continue to excite interest as a scientific curiosity. Secrecy is of the very essence of all telegraphy; but there can be no secrecy where messages are thrust violently into the air, to be picked up by the first eavesdropper who comes along."

It would be useless to attempt to answer such an absurd and unsupported statement, for enough evidence has been produced during the past few years to expose its hollowness, but we would recommend readers to turn to the report of Mr. Marconi's speech on page 24 of this issue, which should finally dispose of the dying echoes of the malicious statements concerning wireless circulated in the early days. We have referred to this article not because, in our opinion, it deserves an answer, but because it has a certain amount of historical interest, showing as it does the kind of opposition against which Mr. Marconi had at one time to contend. That he has overcome it is due entirely to the imperishable greatness of his work.

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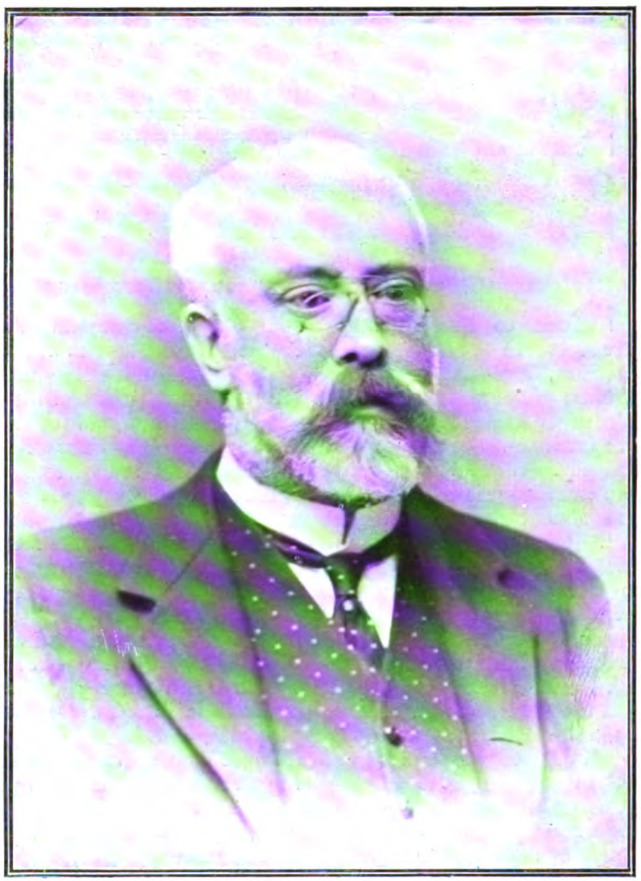

DON ANTONIO COMYN,
CONDE DE ALBIZ.

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His Excellency Don Antonio Comyn, Conde de Albiz,

Managing Director of La Compania Nacional de Télégrafia sin Hilos.

WITH the opening by His Majesty the King of Spain of the Marconi Station at Aranjuez, near Madrid, thus completing an important chain of internal and external wireless communication for Spain, the past month will stand out with prominence in the annals of wireless telegraphy. It must be a supreme happiness to the Directors of La Compañia Nacional de Telegrafia sin Hilos to contemplate the results of their work, and it is no mere figure of speech to say that the whole civilised world will, with the passing of time, feel with increasing effect the benefits conferred on it by those who have adopted Mr. Marconi's great work in Spain and the Canary and Balearic Islands. It is appropriate, therefore, whilst the world is still echoing another great Marconi success, to place before our readers a study of the central figure in the Spanish organisation, which has ensured that success.

Don Antonio Comyn, Conde de Albiz, is a typical specimen of the men who have made wireless telegraphy a great world power.

Moreover, he combines qualities which are, unfortunately, not too commonly found in association. A man of high social standing, and holding a distinguished position at the Court of Mis Majesty King Alfonso, the courtly nature of Señor Comyn covers a genius for work which comprises legal, political, and commercial spheres. The hackneyed saying that genius is an infinite capacity for taking pains is a sort of half truth. The man of genius possesses that capacity, but it is simply because he is inspired by a great idea. He sees the object of his quest before him like a light which he must follow. He is intensely possessed by it, and cannot desist from the search until he finds it. He is forced to take infinite pains by the fire within him, and that is the real genius.

Señor Comyn was born in Madrid in the year 1858. His father, who was for a considerable number of years Minister Plenipotentiary for Spain at the Court of St. James's, before Spain was represented in London by an Ambassador, is of Scottish origin, but the family have been settled in Spain for several centuries. On the maternal side Señor Comyn is of Irish descent, but there is no mistaking his loyalty and devotion to the country of his birth—Spain. The early education of the subject of our sketch was well conceived with a view of fitting him for the distinguished rôle which he was destined to fulfil in later life. He has had a cosmopolitan education, having studied at the University of Madrid, at University College, London, in Austria, and elsewhere. He is a gifted linguist, and in addition to his native tongue he speaks fluently French, German, Italian, and English. He graduated as a Doctor of Law at the Madrid University, and was later engaged in the Spanish Diplomatic Service, leaving that to enter the legal profession where he became distinguished as an international jurist. As has already been mentioned, Señor Comyn holds a prominent part at the Spanish Court and moves in the highest Society in Madrid. It is no wonder to find a man of his patriotism, his extensive knowledge, and instinct for work absorbed for many years in political life. He was elected in the Conservative interest a Member of the Spanish Cortes, and served, first as a Deputy and later as a Senator, for the last twenty years. He has held the office of Attorney-General in the Court of Accounts, and has been the Under Secretary of State in the Ministry of General Azcarraga.

Possessing a natural aptitude for finance, he quickly discovered his *métier* in the Cortes, and was for four years Secretary to the Budget Commission, which is one of the permanent Committees of the Parliament, and took a very prominent part in the deliberations of this Commission and in the discussions on financial subjects in Parliament.

Some time ago, whilst holding the post of legal adviser to the British Embassy and Consulate at Madrid, he became acquainted with the Marconi system of Wireless Telegraphy, and on the formation of La Compañia Nacional de Telegrafia sin Hilos, sixteen months ago, he was elected Director and Legal Adviser, and very soon afterwards he was appointed Managing Director. So absorbed did Señor Comyn become in the Marconi system of Wireless Telegraphy, and so zealous was he for the promotion of its interests, that practically the whole of his time and efforts have been devoted to the development and extension of the Marconi System in Spanish territory, with results that are alike creditable to himself and to his eminent coadjutors on the Spanish Board.

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Spanish Internal Communication

Opening of a Central Wireless Station at Aranjuez

Notable Royal Messages

THE opening on Saturday, January 27th, of the Marconi wireless station at Aranjuez near Madrid was described in some of the Spanish papers under the heading "*UNA FECHA HISTORICA.*" In the light of subsequent events, the occasion has fully merited the great importance attached to it in high official circles and by the general public, whose varying shades of opinion were so admirably reflected in the capable Press of the country. During the closing days of January, Spain added an eminent chapter to her glorious history when she placed herself in the forefront among the great nations in the matter of telegraphic communication, and the sagacity of her councillors and business men in perceiving the important benefit to be derived from Mr. Marconi's epoch-making discovery, and adapting it on an elaborate scale to the requirements of their country has stamped them as worthy descendants of the immortals who made Spain the intellectual light she was during the dark ages. What more fitting than that the Royal head of the State should show his approval of the great enterprise and personally open the station which serves as the great artery for the internal telegraph communications of the country, and binds Spain by invisible electric waves to distant lands.

King and Queen of Spain at the Aranjuez Station

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His Majesty King Alfonso, who performed the inaugural act, was accompanied by his gracious Consort, Queen Victoria, by the Princes Maurice and Leopold of Battenberg, prominent members of the Government, diplomatic, naval, and military representatives, and leading public officials. The list of distinguished guests present was an imposing one, as the following representative selection testifies: Sir Maurice de Bunsen, British Ambassador, and the Italian Ambassador; Their Excellencies Don A. Barroso, Minister of the Interior; General Luque, Minister of War; General Don José Pidal, Minister of Marine, and Don Bernardo Sagasta, Director General of Posts and Telegraphs. Others present included Don Esteban Diaz, Inspector General of Posts and Telegraphs; Don José Camino, Chief of the Wireless Department; Generals Bascaran, Contreras, and Cabañas, Colonel Figuerola Ferretti, Marquis de Valdeiglesias, etc.

The station was opened amidst most propitious conditions, and numerous messages were exchanged with England, Italy, Canada, and even with the King of England then on board the "Medina" on his way home. But before we describe the station and reproduce some of the historic messages that passed on that eventful Saturday, a word may be devoted to the admirable site chosen for the new station.

Of the many attractive spots used as sites for wireless stations, Aranjuez is one of the most prominent. Situated in a broad valley where two rivers meet—the historic Tagus, and the less renowned Jarama—this enchanting centre has been for centuries the pleasure resort of kings. The origin of the name itself—Ara Jovis—indicates that the Romans had, in their day, erected a temple there. Formerly the abode of the Grand Masters of the Knights of Santiago, Aranjuez became a royal residence in the reign of Philip II., who commissioned the famous architect of the Escurial—Juan de Herrera—to lay the foundations of a royal palace, which was completed and embellished under Philip V., Ferdinand VI., and Charles III. Although the palace teems with valuable works of art, for many, the chief attractions of Aranjuez lie in the beautiful gardens and park

Outside the Aranjuez Station: Second group on left—British Ambassador, Prince of Battenberg, and Italian Ambassador. Third group—Mr. Childs, Mr. P. Eisler, and Lieut. Moreno-Queseda.

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laid out on a plan which recall some of the fantastic scenes described in the "Arabian Nights." It was on this enchanting site that the engineers of Marconi's Wireless Telegraph Co., Ltd., erected the central station of the public wireless telegraph service in Spain. When it was found advisable to establish this building in the neighbourhood of the capital, Toledo was at one time thought of as likely to furnish a site for a central station, but its rocky foundations which have so bravely defied the ravages of the ages could not compete with

over sea, and for a maximum range considerably in excess of this figure. The installation is arranged to work on a 7,000 ft. wave length for communication with the fixed stations. Direct communication has been maintained at all times of the night and day between Poldhu and Aranjuez. Such portions of the installation as the masts and aerials, lend themselves but little to descriptive treatment, and it is sufficient to mention that the former are of the sectional steel type with wooden top masts, the main mast being 257 ft high

King and Queen of Spain and Party leaving the tent where they took tea

the soil of Aranjuez as a *prise de terre*. The station is erected in a large field compassed by an olive grove on the outskirts of the park. It lies at the foot of a low line of hills about half a mile from the railway station. So much for the site; it now remains to describe the interior of the Aranjuez Station. As we have already explained, this station is intended to communicate with Vigo, Barcelona, and Cadiz, also with Alicante or another suitable site to be selected later, the working ranges being 290, 320, 300, and 265 miles respectively. This is equivalent to a distance of 575 miles

for the transmitting aerial, and 265 ft. for the receiving aerial. The aerial system consists of one main two-part six-wire Tee aerial, each limb independently supported, between the centre mast and a triatic connecting the outer pair of masts. A receiving aerial has been erected above the transmitting aerial, consisting of four wires, one to each outer mast. The connections between the operating house and the extensions of these aerials are made by independent conductors.

We now pass through the engine house and the room in which the electrical current is

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generated. The prime mover consists of an oil engine, which, with its various accessory parts, forms an imposing feature of the installation. The engine is provided with an extended sub-base, and is coupled to the direct current generator, which is mounted on that sub-base. The generator consists of a continuous current dynamo direct coupled with the prime mover supplying continuous current at 110 to 160 volts for motor generator, charging accumulators, or lighting. The dynamo is fitted with a suitable field regulating resistance to vary the supply voltage for the range specified, and is furnished with the necessary foundation bolts and usual accessories. It is protected from high frequency surges by graphite shunting resistance.

The motor generator combination is arranged for direct driving of a discharger mounted on an extension of the alternator shaft, and on a common bed. The combination is provided with a motor starting resistance with underload and overload release, capable of carrying the full load current continuously on any stop, and a motor field regulating resistance capable of varying the motor speed 16 per cent. on either side of the normal, and alternating field regulating resistance capable of regulating the alternating voltage from normal to 30 per cent. below normal.

The switchboards are of the usual type equipped with the necessary switches and instruments. There are three panels, one for dynamo and battery, one for motor generator, and the third for alternator. All the wiring is carried underground in trenches covered by chequer plates.

Then there is also the battery of accumulator cells, a familiar sight in wireless stations. The transformer is of the single phase core type, and is furnished with external means for altering the voltage as required. The low frequency primary inductance is of the air cooled iron core type, and together with the transformer is protected by two special air core chokes. Besides the condenser battery, there is a discharger, consisting of a copper disc with peripheral studs rotating between multiple electrodes, the disc being direct coupled to the alternator, and provided with an adjustment for the electrodes to bring the instant of discharge into phase with the alternating cycles. The transmitting jigger is of the independent primary and secondary type. The aerial tuning inductance consists of one independent winding of cable similar to that of a jigger secondary. The standard Clifden transmitting apparatus is provided, and the "electric eye," as the receiver has been so aptly named, is of the valve type with intermediate circuit ranged for the reception of waves between 2,500 and 8,000 ft. Of course, a magnetic detector receiver is also provided with multiple tuner.

View of Masts and Aerials at Aranjuez

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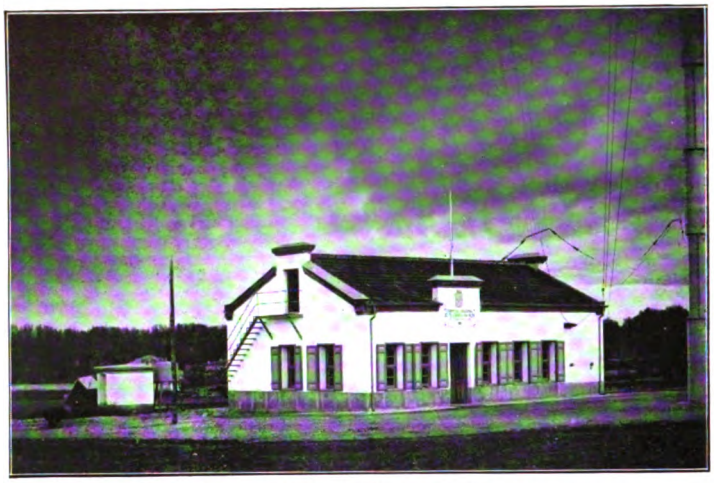
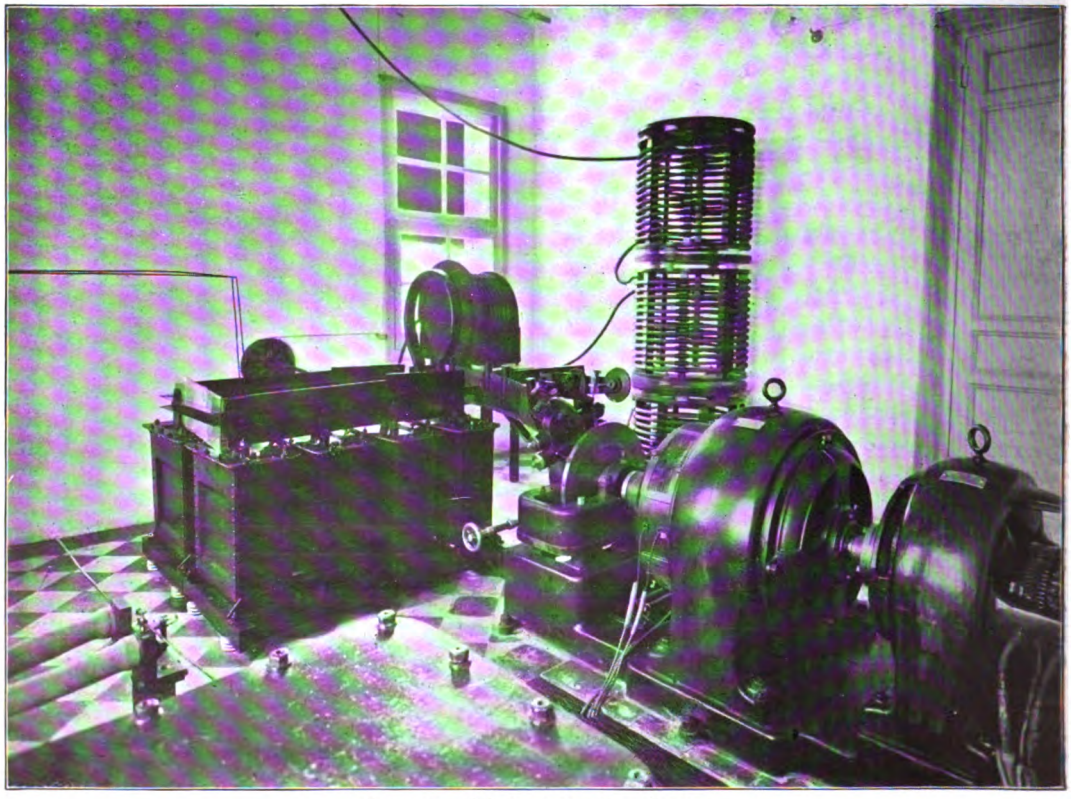


Cutside view of the building, Aranjuez Station

The arrival upon the scene of the Royal Party was the signal for a great deal of enthusiasm. Conde de Albiz, the managing director of the Compañia Nacional de Telegrafia sin Hilos, presented Messrs. Eisler and Childs, the engineers of the Marconi Company, to their Majesties, who immediately insisted upon inspecting all there was to be seen at the station; the King asking for information concerning a number of points which aroused his curiosity, and this information was supplied him by Lieutenant Morena Quesada, the chief engineer of the Aranjuez station. The Queen even endured the metallic clang of the spark generator, the first note of which, transmitting the message to the King of Italy, burst out with almost impolite suddenness whilst Her Majesty was examining the copper disc.

It is unnecessary to refer in further detail to the opening ceremony, except to pay a tribute to the admirable reports which appeared in the Spanish Press. It would be impossible



Generating Plant at Aranjuez Station

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to give a list of the newspapers of Madrid and the provinces which dealt so well with the proceedings, but acknowledgments should be paid to the *Mañana Debate*, *Epoca*, *Pais* and *Heraldo de Madrid*. Many of the papers printed some of the telegrams which were dispatched from Aranjuez at the opening ceremony, and those received shortly after the departure of the Royal Family. In view, however, of the importance of the occasion, and the historical interest which attaches to these communications, we set out below the full texts of the telegrams exchanged.

The telegrams were dispatched in the following order :

KING OF SPAIN TO KING OF ITALY, 3.48 p.m.

Le Roi, Roma.—" Au moment d'inaugurer le service publique de télégraphie sans fil je tiens à saluer en la personne de Votre Majesté l'Italie toute entiere, Patrie du grand inventeur Marconi.—*Alfonso.*"

KING OF SPAIN TO KING OF ENGLAND, 4 P.M.

The King on board the "Medina."—"In inaugurating the wireless Marconi station Aranjuez - Madrid our first thought is for you both and beg to send you our loving best wishes for a happy journey and our kindest regards.—*Ena-Alfonso.*"

KING AND QUEEN OF SPAIN TO QUEEN ALEXANDRA, LONDON, 4.48 P.M.

"One of our first Marconi messages is for you dear Aunt to send you our most affectionate greetings and kind remembrances. Much love.—*Ena-Alfonso.*"

HIS EXCELLENCY SENOR SAGASTA, POSTMASTER-GENERAL, TO MR. MARCONI, LONDON.

"Le Directeur Général des Postes et Télégraphes félicite et adresse ses meilleurs souhaits à Monsieur Marconi et marconigraphistes du monde entier.—*Bernardo Mateo Sagasta.*"

INSPECTOR-GENERAL TELEGRAPHS SPAIN TO INSPECTOR-GENERAL TELEGRAPHS LONDON, 5.5 P.M.

"En nombre del Cuerpo de Telegrafos le felicita y saluda à radiotelegrafistas del mundo entero.—*Esteban Diaz.*"

The following wireless telegrams were received at Aranjuez at the times stated :

MR. MARCONI TO COUNT ALBIZ, 4.30 P.M.

"Kindly convey my respectful homage to His Majesty the King.—*Guglielmo Marconi.*"

MR. MARCONI TO COUNT ALBIZ AND THE COMPAÑIA NACIONAL DE TELEGRAFIA SIN HILOS, 4.30 P.M.

"Upon occasion of inauguration of Aranjuez station I send my sincere congratulations to my colleagues and my best wishes for the success of your company.—*Guglielmo Marconi.*"

MR. GODFREY C. ISAACS, MANAGING DIRECTOR OF MARCONI'S WIRELESS TELEGRAPH CO. LTD., TO COUNT ALBIZ AND COLLEAGUES COMPAÑIA NACIONAL DE TELEGRAFIA SIN HILOS ARANJUEZ, 4.30 P.M.

"I congratulate you upon opening of Aranjuez station and I trust in the near future the arrangements of our respective post offices will allow of the inauguration for Spain of a commercial wireless telegraph service with this country through to New York and Canada and many other parts of the world.—*Godfrey Isaacs.*"

Internal View of the Battery Room

PREMIER CANADA TO PREMIER SPAIN, 4.35 P.M.

Ottawa *via* Marconi's Wireless : "I am glad to have the privilege of extending to the Spanish Government and people the heartiest congratulations and good wishes of my Government and of the people of this dominion on the occasion of the opening of your first long-distance wireless telegraph station.—*Borden, Premier of Canada.*"

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MINISTER OF NAVAL SERVICE CANADA TO MINISTER OF AGRICULTURE, TRADE AND COMMERCE OF SPAIN, 4.45 p.m.

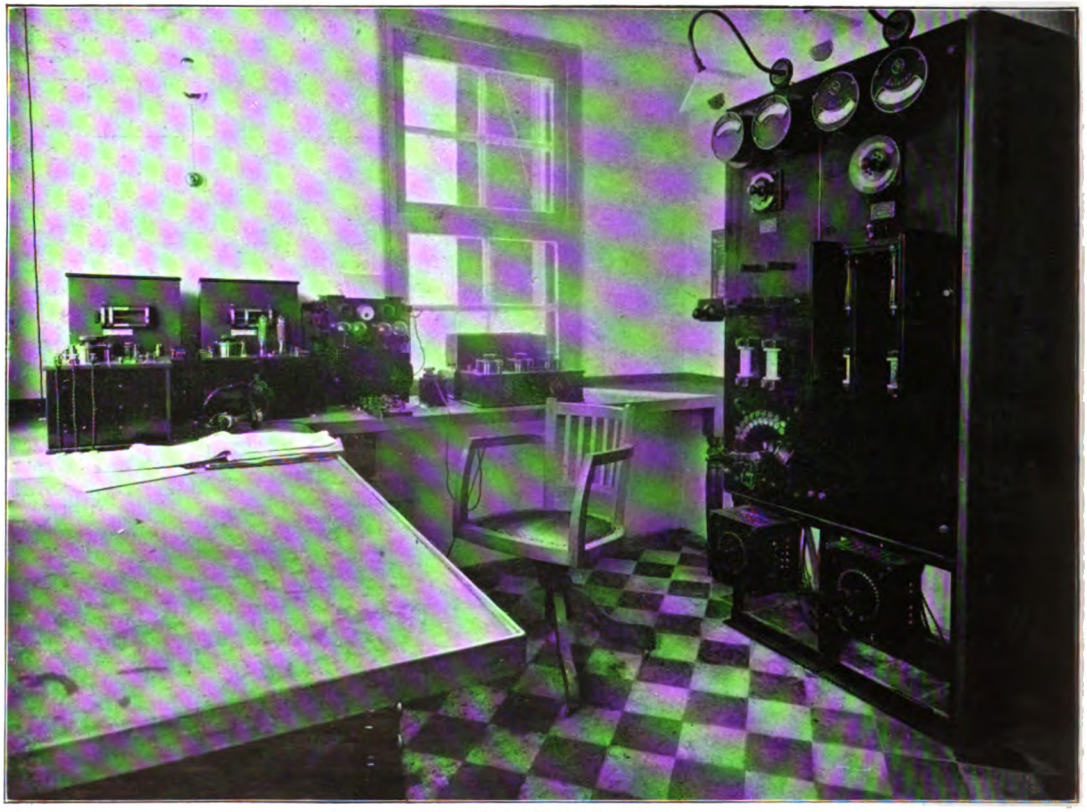
Ottawa *via* Marconi Wireless : " The successful inauguration of radiotelegraphic communication between Spain and the Dominion marks another step forward in the development of scientific accomplishment and it affords me much gratification to be able to extend to you the best wishes of my department by means of one of the first messages transmitted to the Aranjuez Marconi station.—*Hazen, Minister of Naval Service.*"

KING OF ENGLAND TO KING OF SPAIN, 5.5 P.M.

From H.M.S. " Medina " *via* Gibraltar : " Heartily congratulate you on the inauguration of your new Marconi station. May and I greatly appreciate you and Ena sending us the first message and thank you for your kind wishes. We are now on our way to Gibraltar. Our best love to you both.—*George.*"

The following wireless message was dispatched by Señor Cañalejas, the Spanish Premier, to Mr. Borden, Prime Minister of Canada :

" In the name of the Government and the Spanish nation I have pleasure in thanking you for your kind telegram, and reciprocate the cordial congratulations which you expressed in the name of the Government and of the people of the Dominion of Canada on the occasion of the inauguration of the first long-distance wireless station in Spain.—*Canalejas.*



View of the Operating Room

The Minister of Public Works sent the following message through Aranjuez to Mr. Hazen :

" I hasten to give you my thanks for your affectionate salutations on the occasion of the inauguration of the Aranjuez wireless station. It is gratifying to me that my first Marconigram should be an expression to you of my appreciation of such an important

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development in radiotelegraph communication, and I trust this may be the means of tightening the bonds of goodwill between our two countries.—*Gasset.*"

Official Tests of Spanish Stations

SEÑOR DON JOSÉ SANDOVAL ESPIGARES, a distinguished officer of telegraphs in Spain, and the special delegate of the Royal Commission appointed to carry out the tests of the stations erected in Spain by Marconi's Wireless Telegraph Co., Ltd., at Madrid (Aranjuez), Barcelona (Prat de Llobregat), Cadiz, Las Palmas, Teneriffe (Canary Islands), Soller (Balearic Islands), and Vigo with the high-power station at Poldhu (England), distance varying from 940 to over 2,000 kilometres, left London on his return to Spain in January. The tests carried out during the forty-eight hours (December 21st and 22nd, 1911) and the forty-eight hours (January 6th and 7th), under all atmospherical conditions, were excellent, especially when account is taken of a heavy storm in the ocean during the latter period.

Señor Sandoval Espigares expressed his admiration and great satisfaction with the results of the tests, and with the precision, celerity and accuracy with which all messages and signals were transmitted and received. Various messages of congratulation were exchanged between the other members of the Royal Commission who were operating at the stations in Spain, referred to above, as well as with Marconi's Wireless Telegraph Co., Ltd., for having given the Spanish Government a range of 1,000 kilometres more than the maximum for which they contracted.

Directors of the Compañia Nacional de Telegrafia sin Hilos. Reading from left to right: Señor Rohr, Don Alonso Martinez, Señor Setuain, Don A. Comyn, General Bascaran, Senor Estelat

The Concessionaires for the Public Wireless Service in Spain, the Compañia Nacional de Telegrafia sin Hilos of Madrid, are actively negotiating with the Spanish Government with a view to settling the question of tariffs and rates for an international radiotelegraphic service which they trust to inaugurate shortly, enabling Spain to communicate, by the most

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up-to-date means, with the whole world for the benefit of the commerce and the general progress of the country.

Compulsory Wireless on Spanish Vessels

THERE has been issued by the Minister of Marine at Madrid a circular emphasising the necessity of Spanish mercantile vessels being fitted with wireless telegraph apparatus. Reference is made to the laws and regulations already in force in Austria, Italy, and the United States. The General Association of Shipowners have urged the Government to take action in the matter, their view being that wireless telegraphy is essential to shipping. Accordingly the following order has been issued by Royal Decree :

1.—That from the first day of August, 1912, all Spanish mercantile ships shall be fitted with wireless telegraph apparatus, provided (*a*) they are engaged in carrying passengers or mails, and (*b*) that they carry more than fifty persons on board during a transatlantic voyage, including in this number the crew.

2. The wireless telegraph apparatus shall have the necessary efficacy and be erected according to the instructions contained in the regulations issued by the Ministry of the Interior and the General Direction of Posts and Telegraphs, in order to put into force the Royal Decree of January 24th, 1908, and as a consequence of the International Congress of Berlin signed by the representative of Spain on November 3rd, 1906.

3.—This Royal Decree shall be communicated to the shipping companies, pointing out that wireless telegraph stations on board have to be approved by the Department.

4. The shipping companies shall communicate with this centre through the harbour authorities when the installation has been completed and is in a position to work efficiently, so that a technical commission may recognise and test it in order to issue a complete report of same, and to add the said report to the action with a view to finally sanctioning the service, according to previous permission of the War Office and of the Home Office.

The *Heraldo de Madrid* publishes the text of the Bill which Marquis de Cortina, a member of the Spanish Cortes, has submitted :

Commencing from January 1st, 1913, no passenger shall embark in Spanish ports on any ship which has not been provided with wireless apparatus, the maritime authorities only granting the necessary authorisation after ascertaining the good working order of the apparatus.

Uruguay and Wireless

WE referred in our last issue to a decree issued by the Uruguayan Government, making it compulsory for ships carrying passengers between the harbours of the Republic and those of foreign countries to be fitted with radiotelegraph installations. The following is a translation of the main clauses of the decree issued by the Minister of War and Marine :

Considering that wireless telegraphy is not only a useful service to shipping, but is especially a very important means of precaution and assistance in case of accidents, etc., the President of the Republic resolves and decrees :

Clause 1.—Commencing from May 1st of the present year all the ships carrying passengers between the harbours of the Republic and those of foreign countries shall be fitted with radiotelegraph installations.

Clause 2.—The said installations shall be designed to receive and transmit telegrams up to a distance of not less than one hundred kilometres on the ships of river navigation, and four hundred kilometres on those of the oceanic navigation.

Clause 3.—The installations shall be permanently kept in good conditions of working, and capable of intercommunicating with the stations of the Republic.

Clause 4.—The stations shall be in charge of persons well acquainted with the use of radiotelegraph apparatus.

Clause 5.—The service of the stations shall be entirely in accordance with the provisions of the International Radiotelegraph Convention of Berlin.

Clause 6.—The agents of the companies will inform, before expiration of the time fixed, the General Inspector of the National Services of Wireless Telegraphy of the characteristics, system, power, etc., of the radiotelegraph apparatus to be fitted on the ships of their companies.

Clause 7.—The ships which after expiration of the time fixed by Article 1 have not complied with the provisions of this Decree, shall not be authorised to carry passengers in the harbours of the Republic.

Wireless communication is to be maintained with Dr. Mawson's expedition to the South Pole by means of intermediate stations between the exploring party and Hobart.

A wireless station, comprising operating and power building and a dwelling-house, is to be erected in the Isle of Wight, on the drying green attached to Lloyd's Signal Station at St. Catherine's Point.

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Wireless Tuition in Paris

THE Committee of the International Society of Electricians have decided to institute at their school a special section for practical and theoretical instruction in wireless telegraphy. This section will be quite distinct from the regular instruction of the school, which does not undergo any change. The number of pupils to be admitted has been fixed at the maximum figure of twenty. Admission will be allowed by order of merit, and will be decided by the Board of Improvement of the school. The candidates must possess general knowledge of sufficient extent to follow with success the new course of instruction. In particular, the engineers of the high school and of the important schools will be admitted according to the number of vacancies available.

The instruction will be given on the same plan as the regular instruction of the school. It will consist of :

1. A course of about twenty lessons in practical radio-telegraphy conducted by Commandant Ferrie.

2. A course of about ten lessons on the theory of radio-telegraphy, by Naval Lieut. Tissot.

3. Practical work in theoretical and practical radio-telegraphy (Commandant Ferrie, Director of Practical Works; Captain Brenot, Chief of the Works; M. Jegou, qualified engineer of the Electrical High School, Assistant).

4. A series of preparatory lectures on :

(*a*) Motors (M. Bochet).

(*b*) Electricity (M. P. Janet)

(*c*) Usual electric metres (M. Chaumat).

5. Preparatory practical work on usual metres and the principal machine experiments (M. Millien, qualified engineer of the Electrical High School, Chief of the Works).

The following series of lectures will be delivered on special subjects having relation to wireless telegraphy :—Wireless telephony, by M. Jeance, Naval Lieutenant, qualified engineer of the Electrical High School; Administration regulations relating to wireless telegraphy by M. Bouthillon, Telegraph Engineer; Buildings and masts by Captain Becque; Electric discharges in gases by M. Villard, member of the Institute, and M. Abraham, lecturer of the Normal High School; General ideas of meteorology by M. Angot, director of the Electrical Meteorological Office, etc.

A French Exhibition

La Compagnie français Maritime et Coloniale de Télégraphie sans fil (the French Marconi Co.) recently exhibited, at the " Grand Palais," Paris, two wireless apparatus for intercommunication, the action of which keenly interested specialists as well as the public. The illustration shown here represents one of these apparatus (type 1½ kw.). On the left of the stand is shown a reduced model of a liner, loaned for the purpose of the exhibition by the Compagnie Générale Transatlantique, this fitted with an antenna which greatly facilitated the demonstrations of MM. Vivien, chief engineer, and Taulera, the second engineer, when they were explaining to visitors the practical working of wireless telegraphy at sea. Near the apparatus one of these visitors is seen reading, with interest, the *Atlantic Daily News*. At the transmitting key is M. Drevelle, an operator and chief fitter in the employ of the Company.

Marconi Apparatus at an Exhibition in Paris.

This is the first time wireless telegraphic apparatus has been exhibited in use at Paris, and it aroused much interest. The attendance of the public was considerable, and great success was achieved, several orders being placed by State engineers.

Professor G. W. Osborn Howe delivered a lecture entitled " Recent Progress in Radio-Telegraphy " before the Royal Society of Arts, on January 31st. An abstract of this lecture will appear in our next issue.

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Long-Distance Radio-telegraphy.

Day Currents Over Salt Water. Effects of the Sun's Rays.

SOME time ago Dr. L. W. Austin carried out a series of long-distance wireless experiments, which were described in a bulletin issued by the Department of Commerce and Labour, Bureau of Standards, Washington, U.S.A. In order to determine the law of the degrees of the intensity of a signal with the distance, a smooth curve was drawn through observed day readings, and points on this were taken as the approved values for purposes of calculations. It was assumed from the results of Duddell, Taylor, and Tissott that the received currents would be inversely proportional to the distance provided no absorption existed. The observed curve indicated that this was approximately true up to a point between 100 and 200 miles, but beyond this point the currents evidently dropped much more rapidly. The simplest assumption in regard to absorption is that it is proportional to the distance. Adding this to the Duddell and Taylor law, Dr. Austin has found the following expression for the received current :

$$I_R = \frac{K}{d} e - Ad$$

where d is the distance, K the received current at unit distance, e the base of the natural logarithms, and A a constant.

Dr. Louis Cohen, while testing the validity of this formula, made the discovery that A was inversely proportional to the square root of the wave length within the limits of accuracy of the observations. Then writing $A = \frac{a}{\sqrt{\lambda}}$ the expression becomes

$$I_R = \frac{K}{d} e - \frac{ad}{\sqrt{\lambda}}$$

a is the absorption co-efficient, and in these experiments equals 0·0015, the distance and wave length being expressed in kilometres. The curves in Figs. 1 to 5 give the results in graphic form. The dotted line gives the strength of signal which would have been received if the K/d law had obtained ; that is, if there had been no absorption. The continuous curve gives the theoretical day values as calculated from equation 2, while the individual observations are represented by crosses. Observations taken by the deflection method are indicated by circles around the crosses, while night observations are accompanied by the letter N. It is seen that the day observations correspond approximately to the values of the calculated curve, but that the night signals are entirely irregular, being in general stronger than day signals, as was first observed by Mr. Marconi. Sometimes they lie close to the K/d curve, indicating that the absorption has disappeared, while at others they are practically of the same strength as the day readings. In a very few cases night signals were observed considerably stronger than the calculated value for zero absorption, but these may very

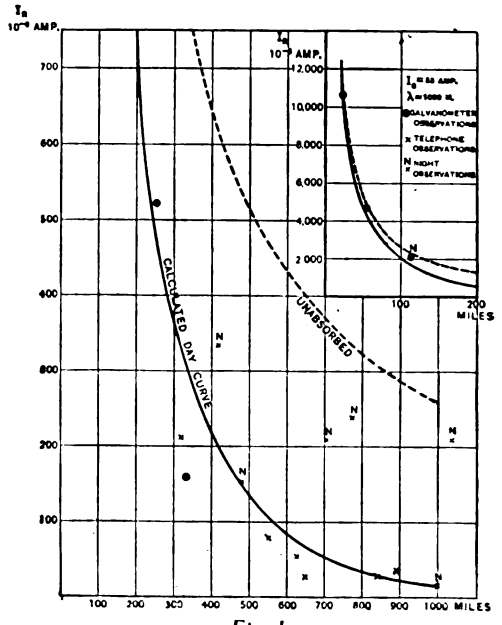

Fig. 1.

probably be due to errors of observation, since it is not observed that the remarkable strength of signal is reciprocal between the two stations. If the observations are genuine, however, it would perhaps indicate some kind of reflection from the upper layers of the atmosphere.

According to the calculations of Zenneck, the conductivity of air at moderate heights cannot explain the magnitude of the observed absorption, neither can the sea-water absorption be of the proper magnitude, according to the same author. But, as the wave front at any

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considerable distance from the sending station must extend far into the upper layers of the atmosphere, it does not seem improbable that

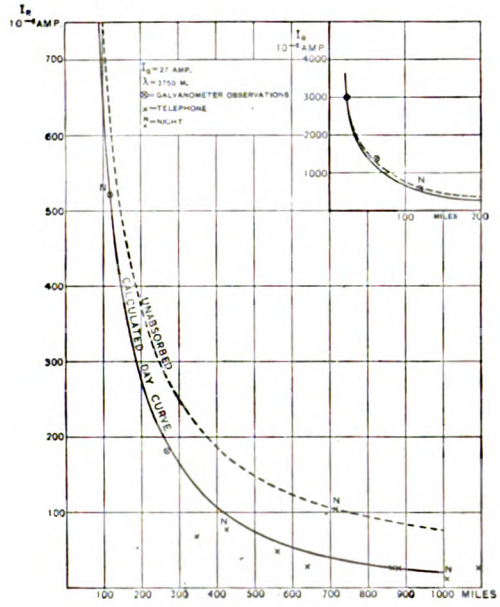

Fig. 2.

this is the region of absorption. If the conductivity is increased by the sun's rays at these heights, this would also explain the differences in the strength of the day and night signals. The observations would indicate, if this explanation is true, that the excessive ionisation may, especially in summer, persist through many nights. The general experience of wireless telegraphy would indicate that during the colder months the absorption dies out more uniformly at night. The day absorption appears from the data obtainable to be fairly uniform throughout the year, at least in the portion of the ocean covered by Dr. Austin's observations, although there are undoubtedly variations at times. With regard to receiving, Dr. Austin has obtained experimental data to furnish an equation which will cover the normal day received current over salt-water through 25 ohms for two stations with flat-topped antennæ of any height with any value of sending current and any wave-length, provided the sending station is so coupled as to give but one wave-length. This equation he writes as follows :

$$I_R = 4{\cdot}25 \frac{Is\, h_1\, h_2}{\lambda d} e^{-\frac{ad}{\sqrt{\lambda}}}$$

where I_R represents the current received through 25 ohms resistance, Is the sending current, $h1$ the height of one antenna, $h2$ that of the other, d the distance between the stations, and λ the wave length, where all the lengths are taken in kilometres and the currents in ampères; a is the absorption co-efficient, which in Dr. Austin's experiments was found to be equal to 0·00015. This disregarding the absorption term $e^{-\frac{ad}{\sqrt{\lambda}}}$ corresponds in form to the Herzian equation for the electromotive force in a vertical resonator at a distance from the oscillator.

TABLE I.

CALCULATED RELATION BETWEEN ANTENNA CURRENT AND DISTANCE FOR TWO SHIPS WITH ANTENNA HEIGHTS OF 130 FT.

Antenna Current *Is*	Working Distance, 40·10⁻⁶amps.		Extreme Distance of Audibility, 10·10⁻⁶amp.	
	Day.	Night (zero absorption).	Day.	Night (zero absorption).
amp.	miles.	miles.	miles.	miles.
1	75	90	200	360
2	135	180	300	720
3	180	270	375	1,080
5	235	450	475	1,800
7	280	630	550	2,520
10	345	900	630	3,600
15	420	1,350	725	5,400
20	475	1,800	790	7,200
25	525	2,250	840	9,000
30	565	2,700	900	10,800
40	630	3,600	970	14,400
50	685	4,500	1,025	18,000
60	725	5,400	1,150	21,600

In Dr. Austin's formula the constant 4·25 applies strictly only to ship antennæ with the

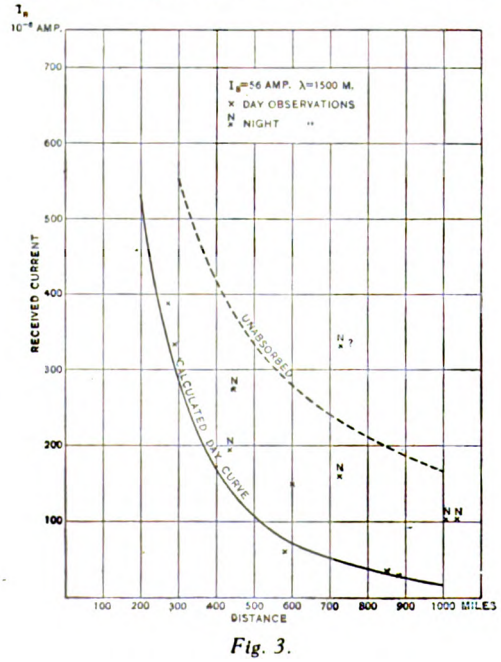

Fig. 3.

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same losses due to masts, rigging, etc., both in sending and receiving, as found on the Scout cruisers. On other ships the value of the

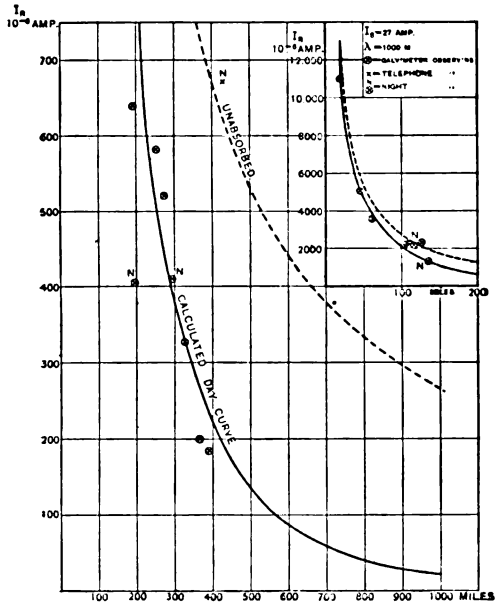

Fig. 4.

constant might probably differ by as much as 30 per cent. under ordinary conditions. This difference in the value of the constant does not, however, make a very great difference in the range of communication, although for short distances it would make a considerable difference in the loudness of signal. To show the variation in range of communication with different antenna currents Table II. is given, showing the range of communication between two flat top antennas 130 ft. high at a wave length of 1,000 metres for various values of the sending antenna current, assuming that 40 by 10^{-6} amperes assures good communication. A quarter of the indicated current would produce audible signals under favourable conditions. The table shows how very slowly the range increases with increasing sending current. Increasing the current from 30 to 60 ampères increases the distance only from 565 miles to about 725 miles, while even with 10 ampères, corresponding to a moderately efficient 2 kw. set, 345 miles is easily reached.

In columns 3 and 5 are given the distances attainable for regular communication and audibility, on the assumption that there is no atmospheric absorption; that is, the extreme range of night communication.

TABLE II.

GOOD WORKING DISTANCE AND SENDING CURRENT FOR TWO STATIONS WITH FLAT TOP ANTENNAS 450 FT. HIGH.

Nautical Miles.	λ=1,000 m.	λ=2,500 m.	λ=3,750 m.	λ=6,000 m
	amp.	amp.	amp.	amp.
1,000	15	13·5	15	17
1,250	38	27	27	30
1,500	91	49	44	46
1,750	200	95	77	74
2,000	490	155	122	105
2,250	—	245	314	160
2,500	—	470	314	235
2,750	—	—	500	335
3,000	—	—	775	500

In Table II. is given the estimated day range of two large stations with flat-top antennas 450 ft. high for various antenna currents, and four wave lengths. The table shows the great advantage of long wave lengths

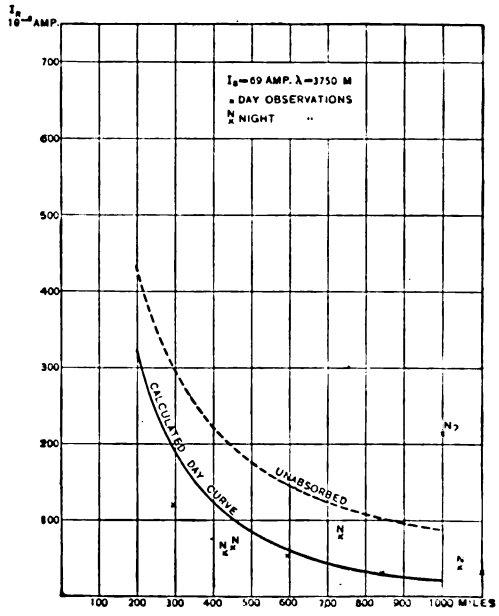

Fig. 5.

for very distant stations. It is seen that for good communication at a distance of 2,500 miles not less than 240 ampères must be used at a wave length of 6,000 metres, though one-fourth of this would be audible.

The Blackpool Tower, which is 500 ft. high, is to be made a wireless telegraphy station during the encampment of the West Lancashire Division of Territorials near Blackpool in August. The officer in charge will provide a powerful installation, and it is hoped to keep in touch with liners leaving Liverpool over a range of 1,000 miles.

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Australasian News

(From Our Correspondent).

Sydney, *January 8th.*

Ship Installations.—During the past few months a considerable increase has taken place in the business among ships trading in Australasian waters, and it is a noteworthy fact that all new ships arriving here with wireless telegraph installations are equipped with the "Marconi" system. Among the leading Colonial steamship lines the Union Steamship Company of New Zealand is well known as one of the largest; they have a large fleet of ships trading from Australian and New Zealand ports. Of the numerous routes served by the Union Steamship Company their Trans-Pacific, Inter-Colonial and Pacific Islands services are the most important.

Recent Orders.—Up to the time of writing the following ships have been equipped with Marconi 1½-k.w. ship installations for the Union Steamship Line: "Makura," "Marama" and "Zealandia," trading between Sydney, Auckland, N.Z., Suva, Honolulu and Vancouver (Canada). The "Tahiti," "Aorangi" and "Maitai" trade between Sydney and San Francisco. The "Tofua," which trades between the Fiji Islands, Samoa, Friendly Islands and New Zealand, has also been equipped with Marconi apparatus. In addition to the foregoing, the Marconi Company have received orders from the Union Steamship Company to equip the following, and the work will be completed shortly: "Maunganui," new ship; "Navua," Wellington and Auckland, N.Z., to Suva, Fiji; "Talune," Auckland, N.Z., to Raratonga, Cook Islands, Raiatea to Society Islands, Papeete to Tahiti; and three others. Messrs. Burns, Philp & Co., of Sydney, have placed an order for a Marconi set for the "Montoro" before she leaves England. The "Montoro" is due to sail from Sydney to Queensland ports on March 2nd, Port Darwin, Sourabaya, Samarang, Batavia and Singapore, calling at Port Moresby (New Guinea) en route. The Royal Packet Steam Navigation Company (Kon. Paketvoart Maatschappij) have ordered Marconi installations for their two new ships, "Van Cloon" and "Van Ostermeyer," which will shortly arrive from Europe to take up their sailing between Sydney, Melbourne and Papua, Java and Singapore.

Lack of Coast Stations.—Considerable additions have lately been made to the fleets of lines trading between here and Europe. The new Orient liner "Orama," the Shaw Saville "Zealandic" and the new P. & O. branch liner "Ballarat" have arrived here during the past few weeks, and all are, of course, equipped with Marconi installations. Notwithstanding the fact that the majority of passenger steamers trading in Australian waters are equipped with wireless telegraphy, Australia is still in the background so far as coast stations are concerned. At the time of writing there is but one station working commercially in the Commonwealth, and that is a temporary station at the Hotel Australia, Sydney. As this station closes at 11 p.m., no communication with shore can be obtained after that hour until the station reopens at 8 a.m.

New Offices.—Offices have recently been opened at Challis House, Martin Place, Sydney, N.S.W., by Marconi's Wireless Telegraph Co., Ltd., and the Marconi International Marine Communication Co., Ltd., and during the absence of the Australian representative, Mr. J. W. Ormsby Hamilton, Mr. E. T. Fisk is acting in his stead. Challis House is one of the finest and most important buildings in Sydney. It is situated in the centre of the city, opposite the General Post Office. The telephone number is "City 4,255."

Diary of Events.

1897.

March 8th.—Beginning of series of demonstrations by Mr. Marconi on Salisbury Plain before representatives of various Government departments, communication being established over a distance of four miles.

1899.

March 3rd.—The s.s. "R. F. Matthews" ran into the East Goodwin Lightship. The accident was reported by wireless telegraphy to the South Foreland Lighthouse and lifeboats were promptly sent to the rescue.

March 27th.—Communication was established across the Straits of Dover between Chalet d'Artois, Wimereux, near Boulogne, and the South Foreland Lighthouse.

1900.

March 10th.—Marconi apparatus installed on the Borkum Riff Lightship and Borkum Lighthouse, and on several German steamers.

1901.

March 1st.—Public Marconi telegraph service inaugurated between five of the principal islands of the Hawaiian group.

1902.

March 17th.—Agreement entered into by the Marconi Companies with the Government of the Dominion of Canada for the establishment of a station in Canada for wireless telegraphic communication between Canada and the United Kingdom, provision also being made for the erection and working of wireless stations in other parts of the Dominion.

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THE MARCONIGRAPH

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The Editor will be pleased to receive contributions; and Illustrated Articles will be particularly welcomed. All such as are accepted will be paid for.

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"The Marconigraph"

The present issue completes the first volume of THE MARCONIGRAPH, and we take this opportunity of thanking our numerous readers for the many expressions of encouragement and congratulation that have been addressed to us during the year.

The aim of THE MARCONIGRAPH has been to set forth in detail month by month all interesting happenings incidental to the development of wireless telegraphy, and to illustrate the growth of the Marconi service in different parts of the world. The extent of the fulfilment of our aim is perhaps best illustrated by a comparison of the present number of THE MARCONIGRAPH with the first number of the volume. In the April number of 1911, which was the first of the volume, the total number of pages was sixteen. In the course of the intervening months the number has nearly trebled itself, and we close the first volume with an issue of forty-four pages, thirty of which are devoted exclusively to literary matter, and fourteen to manufacturers' and other announcements. Finality has by no means been reached, either in the size of the magazine, or in the subject matter with which it deals. In the new volume, which commences next month, we hope to add several attractive features, which will enable THE MARCONIGRAPH to keep pace with, and adequately reflect, the remarkable developments in wireless telegraphy, whilst arrangements are being made for the treatment in a much more complete manner than has hitherto been possible of the scientific and popular aspects of this subject. Those whose subscriptions expire with the present number, will find in this copy, a renewal subscription order form, which we should be glad if they would fill in and return to the publisher, together with a remittance for 3s. 6d. It will be noticed that the subscription rate has been slightly increased, in order to cover the extra postage necessitated by the larger number of pages of the magazine.

The Share Market

Since our last issue the principal business in the industrial market has been in Marconi Wireless Shares, buying in both large and small quantities coming from all parts of the world. A "Spanish and General Wireless Trust Company" was formed to hold wireless shares, particularly those of the Spanish Wireless Company, and a large number of Spanish shareholders have already exchanged their shares for those of the Trust Company, these latter being marketable shares on the London Stock Exchange. No issue was made by the Marconi Parent Company, but a firm having secured some of the exchanged shares

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introduced them on the London market on February 16th at 1 7/16; there was a large demand, and the price rose sharply to 1 3/8, eased off to 1 1/8, and on February 22nd closed 1 1/4, dealings every day being active.

The market in all Marconi issues has been a free and active one, investment buying being very much in evidence.

Prices on February 22nd closed:

Ordinary, 4 1/8-1 1/4.
Preference, 4 1/4-5/16.
New shares, 2 1/8-1 1/4, for £2 paid.
Canadian, 19s.
Spanish and General Trust, 1 1/8.

The Spanish and General Wireless Trust, Limited

Some of the shares in affiliated Marconi companies abroad are of high denomination, representing many different values according to the currency of the country in question and the varying rates of exchange. A "holding" company has therefore been formed, entitled "The Spanish and General Wireless Trust, Limited." The capital of this new company is £350,000 in 350,000 Ordinary Shares of £1 each. The Directors are: Mr. Godfrey C. Isaacs (Managing Director), Mr. Alfonso Marconi, Captain H. Riall Sankey, Major S. Flood Page, and Mr. Henry S. Saunders. The Secretary is Mr. Henry W. Allen, F.C.I.S., with offices at Watergate House, York Buildings, Adelphi, London, W.C.

The object of the Company is to acquire shares in some of the subsidiary Marconi companies, and that of the Compañia Nacional de Telegrafia sin Hilos in particular at the present moment.

It is the intention of Marconi's Wireless Telegraph Company to so arrange in the course of time that the shares of each of its subsidiary companies shall be negotiable and have a free mark in this country. When all the arrangements to this end will have been completed, shareholders of the Parent Company will have no difficulty in appreciating the value of the Company's holdings in its affiliated companies.

The "Debeg" Report

Although it has only been in existence for a little over one year, the Deutsche Betriebsgesellschaft für Drahtlose Telegraphie, M.B.H., who work the system of wireless telegraphy known as the "Debeg" system, by arrangement with the Marconi companies, and the various German companies interested in the Telefunken Company, have achieved a highly successful record. The formation of the company was due to exceptional circumstances prevailing in Germany, and the business of the company is limited to the German mercantile marine only. All German mercantile vessels flying the German flag and fitted with apparatus for wireless telegraphy were transferred to the new company, on whose board sit Mr. G. Marconi, Mr. Godfrey C. Isaacs, Colonel Thys and Mr. M. Travailleur, the two last-named gentlemen representing the Compagnie de Telegraphie sans Fil, Brussels (the Belgian Marconi Co.), who have a considerable holding in the new undertaking. The report of the latter covering the first nine months of 1911, is just to hand, and this discloses a satisfactory state of affairs.

Seventy-eight existing ship stations were transferred to the "Debeg" upon its formation, and during the past few months an additional fifty-two stations have been added, making a total at September 30th, 1911, of 130 ship-stations, distributed amongst the following shipping lines: Hamburg-Amerika, 45; Norddeutscher Lloyd, 43; Hamburg Südamerikanische Damfschiffarts-Gesellschaft, 10; Woermann and Deutsche Ostafrika-Linie, 13; Kosmos-Linie, 7; Roland-Linie, 7; Miscellaneous, 5. Of these stations, 119 are operated by the wireless company, with a subsidy from the shipping companies, the contracts having several years to run. The remaining eleven are loaned to shipping companies. The "Debeg" Company (which we shall use in this article to describe the Deutsche Betriebsgesellschaft für Drahtlose Telegraphie) have entered into an arrangement with the Norddeutscher Lloyd to acquire the shore station at Bremerhaven belonging to that company. This station is not open for public service. The arrangement will provide the means of finding occupation for wireless telegraphists while on land. About 200 telegraphists are employed by the "Debeg" Co. The relations of the company with shipowners have been generally good, but it is curious to note that a certain amount of prejudice still exists amongst the smaller owners against wireless telegraphy, partly on personal and partly on financial grounds. But this prejudice is not of sufficient magnitude or importance to interfere with the business of the company, as an examination of the accounts convincingly proves. The report contains several appendices, one of which gives an exhaustive analysis of the operations of the company. From this it is seen that 36,248 telegrams were transmitted, the number of words being 506,421; the telegrams received amounting to 19,173, representing 305,249 words. The receipts amounted to 496,071.23 marks. So successful has been the business during the past year that the trading shows a profit of 50,014.50 marks, out of which a dividend at the rate of 4 per cent. has been paid, and a substantial sum put aside for reserve. Ample provision has been made for depreciation of the stations and apparatus.

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Mr. Marconi on the Latest Problems of Wireless Telegraphy.

THE annual dinner of the Junior Institution of Engineers on Saturday, January 17th, was presided over by Mr. G. Marconi, who, in the course of a brief speech, gave an interesting account of the development of wireless telegraphy. A graceful compliment was paid to the President by the inclusion in the loyal toast of His Majesty the King of Italy, which was proposed by Vice-Admiral Sir Henry B. Jackson, K.C.B., K.C.V.O., commanding the Royal Naval War College, Portsmouth. It fell to the lot of Professor John Perry to submit a toast to Electrical Intercommunication. Professor J. Perry has the happy faculty of combining sound erudition with native humour, and the effort of the distinguished mathematician on this occasion was decidedly effective. He commenced by disclaiming any more knowledge of the subject than that ambiguous personality, "the man in the street," but he sought relief in the fact that the toast would be responded to by one who knew not only all there was to be known about wave-telegraphy, but all its latest developments. Professor Perry was struck with admiration of the effectiveness of wireless telegraphy. Waves emitted from a small cabin crept eerily all over the earth and the ocean until the message they had to deliver was received; then came the answer by the same invisible means.

The Poetry of Engineering

He thought it a pity that the poets knew nothing of engineering, for in some engineering conquests we had great romances. The thing that would appeal to Professor Perry most, if he were a poet, was the fact that ships battling through the stress and turmoil of the raging storm could receive messages by means of wireless telegraphy from other ships and from the shore. Professor Perry recalled the interesting fact that thirteen years ago he presided over a meeting of the members of the Institution of Electrical Engineers in London, before which Mr. Marconi delivered one of the first lectures on wireless telegraphy in this country. Since that time he had taken a great interest in Mr. Marconi and his work.

Mr. Marconi, whose rising to respond to the toast was the signal for an enthusiastic welcome, reminded those present that since the time referred to by Professor Perry, thirteen years ago, wireless telegraphy had travelled a long way—not merely in the distance covered, but in practicability, reliability, and efficiency. High-speed apparatus was being introduced which would enable radiotelegraphy to compete, and, he believed, to more than successfully compete, in the matter of speed with the long-distance cables. The speed of wireless being more or less a mere mechanical problem, there was not existing, as in the use of cables, any K.R. law in the ether. Mr. Marconi thought that Professor Perry was somewhat impressed with the difficulty in wireless telegraphy caused by atmospheric electricity, but he was glad to be able to inform Professor Perry that this difficulty was being gradually but surely overcome. There had been improvements in the receiver and the effective utilisation of a larger amount of energy in the transmitters. The impulse at the receiving station was so much stronger than it used to be at a given distance that the natural effects did not have the same pull as they used to have. Interference in ship work, due to atmospheric conditions, was now reduced almost to a negligible quantity, whilst at long-distance stations, although the trouble was more prevalent on account of the larger aerials, it was small enough not to materially affect the commercial operation of the stations. Even in tropical stations, such as at Massaua and Mogadiscio, East Africa, there was being successfully carried out constant communication between overland stations for a distance of 1,000 miles.

Mutual Interference

With regard to mutual interference between high-power transatlantic stations, Mr. Marconi remarked that the facility with which interference had lately been prevented had to some extent exceeded his anticipations. At a receiving station situated at a distance of only eight miles from the powerful station at Clifden, messages could be received from Glace Bay, in Canada, without interference from Clifden, even when the latter station was sending with a full power on a wave-length differing only 25 per cent. from the wave radiated from Glace Bay, the ratio between the maximum recorded range of Clifden and eight miles being in the proportion of 750 to 1. This result proved that it was practicable to operate together a great number of long-distance stations on slightly different wave-lengths situated in England and Ireland without danger of mutual interference. He agreed with Professor Perry that the extended use of wireless telegraphy was principally dependent upon the ease with which a number

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of stations could be worked efficiently in the vicinity of each other. Some interference did, without doubt, take place between ships, in consequence of the fact that the wave-lengths adopted in accordance with the rules laid down by the International Convention were not sufficient. In Mr. Marconi's opinion, a considerable advantage would be obtained by the utilisation of a third and longer wave. However, interference was not at all serious, as the following facts would show. Three years ago comparatively few ships carried wireless telegraph installations, the number now equipped was very large, the receipts per ship from messages showed a much greater increase compared with three years ago. That result would not have been obtained if interference had increased with the additional equipment of vessels. Considering that the wave-lengths at present available, so far as Mr. Marconi's practical experience went, ranged from 6 inches to 30,000 feet; and, moreover, that wave-group tuning and directive systems were now available, all tending to overcome mutual interference, it was not difficult for him to feel convinced that this comparatively new method of communication was destined to fill a place of the greatest importance in facilitating communication throughout the world.

Wireless Stories

The final toast, that of the President, was proposed by Mr. S. Bylander, a vice-chairman of the institution, who commented upon the remarkable development of wireless telegraphy within the past few years. Some eight years ago Mr. Bylander crossed the Atlantic on a vessel equipped with wireless apparatus. The vessel, however, was only in communication with another vessel for about two hours during the greater part of the journey, and did not get into communication again until the English shores were reached. Some little distance off the Irish coast the passengers were overjoyed to receive the latest news from Europe by means of wireless telegraphy, and once he spent half the night in the cabin watching with admiration the receipt of messages. Mr. Marconi's work was appreciated all over the world, and he (Mr. Bylander) was proud to think that Sweden should have awarded him the Nobel prize.

Mr. Marconi, in response, said that everybody who had had anything to do with wireless telegraphy could tell a story about it. He was glad to have met Sir H. B. Jackson that evening, for Sir Henry was the first Admiralty representative to meet him (Mr. Marconi) when he first came to England. He concluded by expressing thanks for the warmth of his reception that evening, which had far exceeded his expectations.

Brevities.

An example of the easy-going methods of the people of Brazil was related at Liverpool on the arrival from South America of the Pacific liner "Oropesa." A passenger sent a message by wireless informing a friend in Brazil that he would breakfast with him at his house four days later. The Marconigram was transmitted to the mainland, 1,000 miles away, in two seconds, but the land communications were so slow that the message had not reached its destination 60 miles inland when the passenger arrived at his friend's house. He was able to open his own message as he sat at breakfast.

* * *

A genial correspondent of the *Pall Mall Gazette* is grieved to learn that Mr. Marconi and wireless telegraphy bid fair to kill the pigeon-post. It was a picturesque and useful form of communication, and at French race meetings—Longchamps, Auteuil, and the rest—the pigeons brought the "results" to the offices of the evening newspapers in Paris promptly and reliably. Now they are to be done away with and wireless telegraphy introduced. A lady who was watching the despatch of the pigeons from the course once said to a friend, "I shall never be able to eat roast pigeon again. I should feel as though I were dining off a postman!"

* * *

Science thwarting man-made laws has proved its inestimable value to a valorous "sea-dog" of the United States Navy, when a Lieutenant hurrying from the Government's Asiatic Station to Washington sent a wireless message from the s.s. "Mongolia," several hundreds of miles at sea, that kept the marriage licence clerk's office open for some hours after the regular closing time. The Lieutenant had arranged to marry on a certain day, but the wedding bells would not have chimed for the couple on that day, and perhaps not for several weeks, if wireless telegraphy had not come to the rescue.

* * *

One hears occasionally of judicial decisions that are delivered from other places than a bench or a judge's chambers. According to a contemporary, the Supreme Court of the United States is about to decide upon the validity of a decision communicated by wireless telegraphy. Judge Rodey, of the District Court of Porto Rico, had before him a suit concerning land in the island. He directed an extension of time in which a bill of exceptions could be filed. But the direction was sent by a wireless message while the judge was on his way from Porto Rico to New York, and on thi account its validity has been challenged.

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Reviews of Books

"ARITHMETIC OF ELECTRICAL ENGINEERING." (London : Whittaker & Co., 1s. net.)

This small book on the arithmetic of electrical engineering is an excellent companion volume to the numerous works on electrical engineering, and should prove a valuable aid to the student who desires to acquire the ability to calculate quickly and accurately. The requisite skill to do this can only be obtained by close application and extensive practice in solving numerical examples. It is well known that young students encounter many difficulties when they first endeavour to apply their theoretical knowledge to practical problems, and the plan adopted in this book is first to give very briefly the fundamental quantitative relationships and laws, and then numerous worked-out typical examples illustrating the principles of the subject, as a guide to the student to the methods of tackling practical problems. In addition there are added 300 examples for the student to work himself. These have been carefully graduated, and include most of the numerical questions set at the City and Guilds of London Institute examinations in Electric Lighting and Power Transmission, and Telegraphy and Telephony, as well as a large number of questions taken from the Board of Education examination papers in Electricity and Magnetism. This collection of exercises thus gives an indication of the line of study to follow, as regards theoretical training, which our foremost teachers consider to be essential.

"ELEMENTARY ELECTRICAL ENGINEERING," by J. H. Alexander. (London : Crosby Lockwood & Son, 7 Stationers' Hall Court, 3s. 6d. net.)

We have on several occasions drawn attention to the importance of a thorough knowledge of the principles of electrical engineering to anyone who intends to take up the operating side of wireless telegraphy as a career. There can be no excuse for neglecting to study this subject on the ground of lack of facilities, for not merely are technical classes established in every centre of note in the kingdom, but by means of correspondence courses and suitable text-books a knowledge of the principles of the subject is brought within easy reach of every person, no matter how distant he may be from any big centre. Text-books on the subject are almost too numerous to mention. Mr. Alexander's book on electrical engineering will, in our opinion, be found extremely useful, especially to young artisans. In this book all complicated mathematical formulæ which might tend to confuse beginners or those not well up in mathematics have been omitted. But a cook might just as well attempt to prepare a dish without the essential ingredients as an author to try to write a text-book on electrical engineering which is not on a mathematical foundation. When we say that the student not familiar with mathematics will not be confused by this book we do not suggest that Mr. Alexander's book is on that account less valuable, for he has given some mathematical exercises worked out at full length which ought to assist the student by showing him something of the kind of problems to be met with in practice. The ground covered by this book is extensive. The absolute beginner may find it advantageous to omit, or merely read over, the chapters on alternating currents, alternating current motors, and the generation and distribution of electrical power, confining his attention in the first instance mainly to the remaining portion of the book which explains the fundamental principles of electricity and magnetism, with examples of their use.

"THE RADIO-TELEGRAPHIST'S GUIDE AND LOG-BOOK," by W. H. Marchant. (London : Whittaker & Co., 2 White Hart Street, Paternoster Square, E.C., 4s. 6d. net.)

This book is described as a Manual of wireless telegraphy for the use of operators, and will be found exceedingly useful. The book is not intended for that class of person who through curiosity desires to know something of wireless telegraphy. On the contrary, the aim of the author has been to produce a book which would be of service to those engaged in the practical manipulation of radio-telegraphic apparatus, and who already possess some knowledge of electrical science. The first portion of the book is devoted to a description of the various apparatus which make up a radio-telegraphic installation, and to the principles which guide in their construction and erection. This is followed by a description of many of the so-called systems of wireless telegraphy, and the author has selected the Marconi system as being representative of the spark method of generating electrical oscillations. At the back of the book will be found an entirely novel feature in the form of log sheets, which should enable the operator conveniently to keep a record of his voyages and working. We have no doubt that this feature will meet a need and will be appreciated. The book is well illustrated.

"PRACTICAL ELECTRICIAN'S POCKET-BOOK AND DIARY, 1912." (London : S. Rentell & Co. ; cloth 1s., rexine 1s. 6d. net.)

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(*Continued on page 29.*)

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porated, in addition to the usual revision of existing sections. Progress in electrical matters is indicated by the expansion of the list of central stations, and accompanying names of the engineers-in-charge. This list has grown during the twelve months by little short of three pages. The section dealing with the Diesel engine has been re-written, and now includes some excellent diagrams showing the relative efficiencies of steam, gas, and Diesel oil engines. Another important section, that relating to producer gas, has also been revised and enlarged. Other sections which have undergone special revision and modification are those dealing with petrol engines; comparative costs of electric light and power (the latter now including load and factor tables); motor controllers; electricity meters (additional diagrams of connections); wiring systems, which now include such modern innovations as Woodhouse casing, Henley's new system, Stannos revised instructions, etc.; and measuring instruments, embodying particulars of the "Ducter" and "Ampall." Among the entirely new sections of the 1912 pocket-book is one which alone justifies the moderate price at which this pocket encyclopædia is published—viz., a complete and practical treatment of the subject of bioscope working, illustrated by clear diagrams. Commercial users of the pocket-book are catered for in the new section on depreciation, which embodies a useful table of depreciation allowances. There is a long section dealing with telegraphy, but wireless telegraphy is only casually referred to. This is the one weak feature of an otherwise excellent annual, which should prove extremely valuable to engineers in charge of plant.

"DYNAMO AND MOTOR ATTENDANTS AND THEIR MACHINES," by Frank Broadbent, M.I.E.E. (London: S. Rentell & Co., 1s. 6d. net).

This popular handbook has now reached a sixth edition, which in itself is no unmerited tribute to its value. The earlier issues which we have seen impressed us very much as just the kind of book that was required by engineers who have charge of electrical apparatus, and the new edition right worthily upholds the traditions of the earlier issues. Amidst the text the reviser's hand is seen, and the result is a notable improvement, more especially in the chapters dealing with starting-up and the fundamental principles of the machines which the installation attendant has to deal with. The chapters dealing with parallel running, synchronising, and starting switches, as well as speed control, have been revised, and a new test dealing with brake tests and horse-power calculations has been added. Many alterations and extensions have been made in the chapter devoted to alternating current motors, with the result that the work is brought thoroughly up to date. We cannot too strongly urge upon telegraphists and, more particularly, telegraph engineers, the importance of being thoroughly familiar with faults and causes of breakdown common to electrical machinery. The book under review not only serves this purpose, but what is of greater importance, it explains how to deal with them, and as such it can be confidently recommended as the *vade mecum* of the engineer-in-charge. It is produced in the handy and convenient size which characterises the publications of the well-known house of S. Rentell & Co., and author and publisher are alike to be complimented upon their product.

The recent number of the *Post Office Electrical Engineers' Journal*, published by H. Alabaster, Gatehouse & Co., maintains the high standard which this useful publication has established. It contains a number of interesting articles, including one on the inductance of telegraph apparatus and another on fast speed working on underground cable circuits.

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Timber: Its Decay & Preservation By W. H. Matthews, B.Sc.
Inductance of Telegraph Apparatus
Fast-speed Wheatstone Working on Underground Cable Circuits - - - - By A. Fraser
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Naval and Commercial Stations

THE *Electrical World* of New York recently published a comprehensive outline of the wireless telegraphic development on the United States Atlantic coastline. The author of the article, Mr. James L. Charlton, showed that rather more than half of the coast stations belonged to the Government, and were operated primarily for military purposes, the remainder being operated primarily for commercial purposes. Nevertheless, it must not be forgotten that the Government stations exert a most important influence in support of the mercantile interests, not only by remaining constantly on the watch for alarm calls in cases of disaster at sea, but also in sending out storm warnings to vessels within receiving range. The requirements of a military or naval station are not the same as those of a commercial wireless station. Commercial stations seek to conform as nearly as possible to a standard, so that there may be a maximum degree of security and the minimum amount of delay in the handling of their traffic. On the other hand, naval stations have to cover the maximum possible range, and to control with ease and certainty a wide range in frequencies, so as to be able to change the frequency promptly. In time of war, the advantage possessed by the Navy that has the best drilled and equipped wireless communication system is likely to be enormous. There is a statement in the article by Mr. Charlton to the effect that the intensity of the long-distance signals received on receding vessels is considerable at a distance of about 300 miles, and then falls off rapidly. This statement would have great importance if it were definitely reproducible under all meteorological conditions. Day and night conditions differ so remarkably in regard to intensity of received signals, that exact measurements lose part of their significance. Moreover, the difference in the daylight intensity at different times of the same day, or on different days is very large, and this is even more noticeable in night-time intensity. Nevertheless, the statement suggests the influence of reflection of electro-magnetic waves from the upper layers of the atmosphere, perhaps 40 or 50 kilometres high. It has already been pointed out in the columns of our contemporary, the *Electrical World*, that the atmosphere at a certain elevation must possess a tenuity which in laboratory vacuum tubes is found to be more highly conducting than salt water. If such a layer is conducting to low electric intensities, and the conductivity is developed suddenly at a transition layer, then the sky becomes, electrically speaking, an inverted ocean which would prevent the dissipation of wireless wave energy in three dimensions, or inversely as the square of the distance, and would, except for losses at the ocean surfaces, confine the dissipation to losses in two dimensions, or inversely as the distance. If, however, the layer of electrical conductivity is disturbed so that the conductivity is diffused over a large range of elevation, instead of being confined to a sudden transition surface, then not only will there be no reflection from the upper layers, but the loss through dimensional dissipation will be exaggerated. Long-distance wireless telegraphy seems destined to accumulate a considerable amount of information concerning the upper layers of the atmosphere in regard to their disturbances by winds or solar ionisation.

Until recently, it was possible for a business man to escape completely from the toils of his affairs by taking an ocean voyage, and for the purpose of such recuperation a ship became an emblem of refuge. To-day, however, thanks to the influence of wireless telegraphy, the Atlantic Ocean routes are but extensions of City streets over the water, so far as relates to isolation and repose of the business soul. The business man's ocean steamer life is becoming engrossed in ascertaining how his messages with the shore may be received or dispatched. It seems to be only a question of time when the regular ocean passenger routes will be equally patrolled, and when the great oceans will virtually be reduced to canals as far as relates to communications. This is the future, as sketched by the *Electrical World*, which hastens to assure us that the advantages gained by the new order far exceed the advantages of the old order; yet the change is none the less revolutionary.

American Notes

It is proposed to establish two new wireless stations on the southern coast of Alaska, one at Unialaska, and the other at Kodiax. The erection of a wireless station on the Hawaiian Island of Oahu is also contemplated. An effort will then be made to establish wireless communication between Unialaska and the Hawaiian Islands.

The following is extracted from *Syren and Shipping*:

"We note, dear Major, your remark that 'evidently in spite of the triumph of "wireless" the day of the submarine cable is not yet over.' The statement, of course, is perfectly correct, but you must remember, Major, that 'wireless' has its advantages, after all. It would be diabolically awkward, don't you know, if a big passenger liner had to stop and grope about for the nearest submarine cable whenever she wanted to communicate with the shore!"

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An Australian Review

THE annual supplement to the shipping newspapers of Australia contains a very comprehensive review of the shipping and commerce of the Commonwealth. A feature of interest in reviewing these annual retrospects of trade which invariably strikes us is the appearance from year to year of new branches of industry and new commercial activities. It can hardly be said that wireless telegraphy is either a new industry or a new commercial activity, yet in regarding its growth we cannot but note the fact that it is just at present becoming generally recognised not merely as an indispensable force, but as an industry of very great importance and unbounded potentialities. The article in our contemporary describes the year's developments in wireless telegraphy under the sub-heading of " Innovations," and points out that in the equipment of the newer ships commissioned for the Australian trade, as well as of the older ships, wireless telegraphy has made greater strides than any other device introduced into the maritime world. We are interested to note the striking growth in the use of wireless telegraphy on board the steamers, as evidenced by the supplement before us with that of its predecessor. Last year very few of the steamers running to Australia were equipped for the transmission or reception of wireless messages, as little progress had then been made with the erection of land stations, but the matter has since been taken in hand in earnest, and now almost every company trading with the Commonwealth is having its steamers fitted.

In Case of Shipwreck

Comment is made upon the fact that although wireless has been in existence for the short space of 15 years it has already proved its value in numerous cases of shipwreck and other marine disasters. A ship at sea which has a wireless station on board becomes as much a part of the world's telegraphic system as any town on shore; thus shipowners are enabled to keep in touch with the commanders of their vessels, which is especially valuable in cases of delay or for cargo steamers, where great expense and inconvenience are often prevented by issuing instructions or obtaining information before a ship reaches port. The travelling public are fully alive to the advantages of wireless communication, both as a safeguard against disaster and as a social or commercial convenience, and they invariably prefer to travel by the ship which carries a wireless installation. The realisation of its numerous advantages has caused wireless telegraphy to be adopted by shipping companies throughout the world.

Wherever wireless telegraphy is spoken of the name of Mr. Marconi becomes unconsciously associated, and our contemporary remarks that it is a well-recognised fact that the present position of wireless telegraphy is due to the efforts of the Marconi Company. The rapid development of maritime wireless telegraphy in recent years is aptly illustrated by the fact that the number of merchant ships carrying Marconi installations in the early part of 1910 was no more than 200, while at the time the supplement was prepared, viz. November 1st, 1911, there were over 570 ships of the world's mercantile marine equipped with the Marconi system.

Where Wireless is Employed

During the last two years all passenger ships of the P. & O., Orient, White Star, and Aberdeen lines have been fitted with Marconi apparatus. The new Blue Funnel liners have been similarly equipped, and the Union Steamship Co. have ordered Marconi installations for their trans-Pacific and other ships. The New Zealand Shipping and Shaw, Savill Companies are having their ships equipped with Marconi apparatus, while M'Ilwraith, M'Eacharn & Co. have a similar plant on their s.s. " Karoola," and the Adelaide Steamship Co. have Marconi apparatus on their s.s. " Grantala " and " Koombana."

Many countries have passed laws making it compulsory for passenger-carrying ships to carry wireless installations, and a clause to that effect is being contemplated by the Federal Parliament in connection with the new Navigation Bill. Our contemporary believes that the coming year will see all passenger ships in the Australian trade equipped with wireless telegraphy, and if any doubts are felt as to the best procedure to follow they cannot be far wrong in saying that the example of the larger lines constitutes a valuable guide.

Councillor Kareis and Captain Schimek were the guests of the Association representing the interests of Austrian Posts and Telephones at a recent meeting. Councillor Kareis delivered an interesting address on " The Development of Telegraphy and Telephony." His mind went back to the early days when distance communications were carried out by means of fire signals. This was the case in Greece when Troja fell. Optic telegraphy was first used in connection with electricity after the chemical experiments of Soemmering. With regard to telephony, Councillor Kareis referred to the achievement of Dr. Bell of Boston, the inventor of the telephone, who, being a son of a deaf and dumb teacher, studied the organs of hearing, and succeeded in constructing the first telephone. Captain Schimek referred to the development of wireless telegraphy, and to Mr. Marconi's practical inventions.

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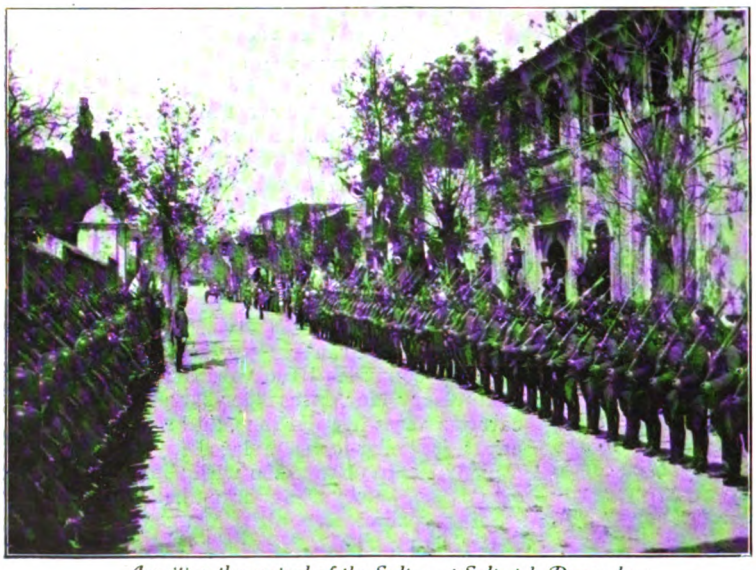
Advances in Field Telegraphy.

The Sultan of Turkey's Interest.

NO modern military system can now be considered complete without a wireless telegraph equipment, and a well-organised system of communication has been created by Marconi's Wireless Telegraph Company in connection with military telegraphy. So much depends on the continuance of wireless telegraphy during war that it is important to study closely the practical development of the art, concurrent with which much scientific investigation has been conducted. Turkey is one of the latest countries to take up field wireless telegraphy, but it has done so only after exhaustive trials, during which the advantages were clearly demonstrated. The trials with wireless field sets carried out in Turkey were described in THE MARCONIGRAPH for September of last year. These created a considerable amount of public interest and attracted the attention of His Majesty the Sultan of Turkey, who evinced an intelligent interest in the operations. He paid a visit to Selimieh Barracks at Scutari and inspected a cavalry station which was erected in the courtyard, and which was in communication with another similar station in the naval barracks at Constantinople. At the Selimieh Barracks he engaged for some time in conversation with the officer commanding the engineer company in charge of wireless—Captain Salaheddin. It is not surprising that the Sultan should have displayed such a keen interest in the subject, for, as is well known, this enlightened monarch combines



Awaiting the arrival of the Sultan at Selimieh Barracks.

H.M. The Sultan arriving at the Gate of Selimieh Barracks.

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The Sultan conversing with Officer Commanding Company in Charge of Wireless

a high degree of culture with zeal for the welfare of his people, and the British nation at all events, are not likely to forget his acts of friendship towards them, first of all in sending a prominent member of his family to welcome the King and Queen of England on their passage through Turkish waters while on their way to England, and later in conferring a high order upon King George. Wireless telegraphy has developed into an implement of immense importance in naval and military operations, and no gifted mind can fail to be impressed by a medium which has so far altered the conditions of ocean travel that great passenger liners, separated by vast distances on stormy seas, speak to each other through the ether with far-reaching voices, and are never out of touch with land during the whole of their voyage from port to port.

The trials with cavalry and infantry field stations which were witnessed by the Sultan were highly successful. A Government Commission, consisting of six members, chosen from the army, navy and posts and telegraphs, sat to select the best system of wireless for military purposes. The Commission were from the commencement favourably impressed with the portability, speed of erection and ease of manipulation of the Marconi stations. At first it was necessary to teach the soldiers how to erect and work the stations, the essentials of which they quickly grasped, in spite of the difficulty of explaining them through an interpreter. Later, one of the stations was moved to the Naval Barracks at Kassim Pacha, and another was erected at the Military Barracks at Selimieh, the stations being respectively worked by the sailors and soldiers. The installation was then removed from Kassim Pacha to Guebseh in Anatolia, 45 kilometres from Selimieh, where the other station remained. Communication was at once established, the signals being very strong. The intervening country was undulating and largely cultivated, the greatest height being 1,000 ft. Two other systems were tried in addition to the Marconi,

Inspection of Cavalry Station in Courtyard, Selimieh Barracks.

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Turkish Sailors at the Naval Barracks, Constantinople, transcribing messages received from Selimieh Barracks.

but they had great difficulty in communicating with their stations at Selimieh, one being unable to get messages through for two days, and the other being unable to get any through at all. The members of the Commission were highly impressed by the success of the Marconi system. In the cavalry sets the limit of weight per horse is fixed at 185 lb., and the actual weight a little less. The whole outfit is carried by four horses, and there are four more carrying riders in attendance. No. 1 horse carries the aerial and various odds and ends arranged in two boxes, which simply hook on to the special saddle used. No. 2 horse carries the high-tension equipment on one side and the low-frequency plant on the other. The high-tension portion is sealed into an hermetically closed box, and is therefore weather proof.

The low-frequency instrument box opens out, leaving all necessary parts accessible to the operator. Both valve and crystal receivers are used. The third horse carries the petrol-engine and the dynamo used for generating the primary current and also the requisite supplies of petrol. The saddle itself can be lifted off by four men and rested on the ground, and them forms the framework supporting the engine and dynamo. These are connected by a flexible shaft, which is removed when the saddle is replaced on horseback. The fourth horse carries the two masts, each of which consists of ten lengths, each 6 ft. long. These are hollow hexagons in section, so as to be light, strong, and capable of being closely packed. The earth used is a mat of copper gauze. The aerial is stretched between the two masts as a horizontal conductor, 350 ft. long. The sending apparatus is connected at one end of this, and a directed wave is obtained, the strength of wave being much greater in one direction than elsewhere.

Admiral Williams (centre) and group of Turkish Naval Officers.

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This plan has great advantages for military equipments. The saddle framings are all constructed out of bicycle tubing, padded to fit the horse, and each saddle will stand when rested on the ground. With skilled men the time needed to erect the plant ready for working is 9 minutes, and to dismantle and pack it again 6 minutes. With unskilled hands in Turkey the equipment, at the first time of asking, was erected in 21 minutes.

One infantry set is identically the same equipment, but carried in two carts. The power needed is 400 watts, and the range, even in mountainous regions, is 20 miles. Over moderately hilly country it is 75 km., and over sea 100 miles. A more powerful equipment with a generator yielding 1½-kw. is also supplied, and this has a range of 200 miles. In this case the height of the masts is 80 ft. instead of 60 ft. The generator supplies 300 sparks per second. This equipment is all carried on a single motor-car.

Exhibition Award

We are informed by our Rome agency that they have received official intimation that three Grands Prix have been awarded for the Marconi exhibits at the recent Turin Exhibition. One Grand Prix is for Marconi's Wireless Telegraph Company, another for Mr. Marconi and the Rome Office, and the other for Mr. Marconi of Bologna and London.

A New Admiralty Station

The new wireless telegraphy station which the Admiralty have erected at Portpatrick is practically completed, and the necessary apparatus is now being fitted. The station is situated on the North Cliff, some distance from the town, and when it is ready for service it will be one of the most important on the Admiralty list, as it will command a wide area of sea on which naval manœuvres will be carried on, and it will be in touch with naval and mercantile shipping on practically all the North Atlantic.

The New Marconi Works

The contractors for the new works required by Marconi's Wireless Telegraph Company, which are to be erected on the county sports ground in New Street, Chelmsford, have made a beginning by preparing the ground for the foundations. The buildings included in the first contract will cover half the field, but when all the proposed extensions have been carried out they will occupy the entire field, with the exception of the land necessary for a railway siding, etc. The first block to be built will stand on an area 460 ft. long and over 150 ft. wide. In the front and on the north side will be the offices, test rooms, etc., and immediately behind these will be three large main shops and a carpenter's shop, the whole forming one large compact block. As soon as the new works are put up and equipped next summer the company will at once find employment for several hundred additional workmen.

Where Wireless is Wanted

The inhabitants of Tiree, a small island forming one of the Inner Hebrides, have become cognisant of the unreliability of their communications with the mainland in times of storm, owing to the breakage of lines. The result is that 500 of the adult population, which represents 25 per cent. of the total population, have petitioned the Postmaster-General and their Parliamentary representative, directing their attention to the necessity of having a wireless station established in the island. With commendable promptitude the Postmaster-General has replied to the effect that the petition will receive his careful attention, and that no time will be lost in making an effort to meet the needs of the island. Naturally, this intimation has occasioned considerable rejoicing in Tiree. Even in the remotest corners of the world the advantages of wireless communication are appreciated, and we have no doubt that the demands of the inhabitants of Tiree will be followed by like demands from communities whose connection with the mainland is solely dependent upon line wires.

Military Wireless Activity

Lieut. A. Handley presided at the annual dinner of the Wireless Telegraph Company, Royal Engineers, at Birmingham recently. In proposing the toast of the company Lieut.-Col. Lister said that the wireless company had not only been without headquarters, but also without gear until this year. They were, therefore, only now in the position in which they ought to have been four years ago. But now they had got one of the best stations, and they had the very latest type of apparatus it was possible for money and skill to produce. General Thorneycroft was keenly interested in the work of the company, and possibly arrangements would be made which would enable the company during the camp on Salisbury Plain to operate over greater distances than on previous occasions. Lieut. Handley, in responding, expressed satisfaction that the company were now equipped with apparatus and ready to take their place in the field. As regarded the prospects, he anticipated that from every point of view the present year would prove the most successful in the history of the company. The drills would be made as interesting as possible, and week-end camps would be arranged, in connection with which it was intended to have the stations operating over a distance of forty or fifty miles.

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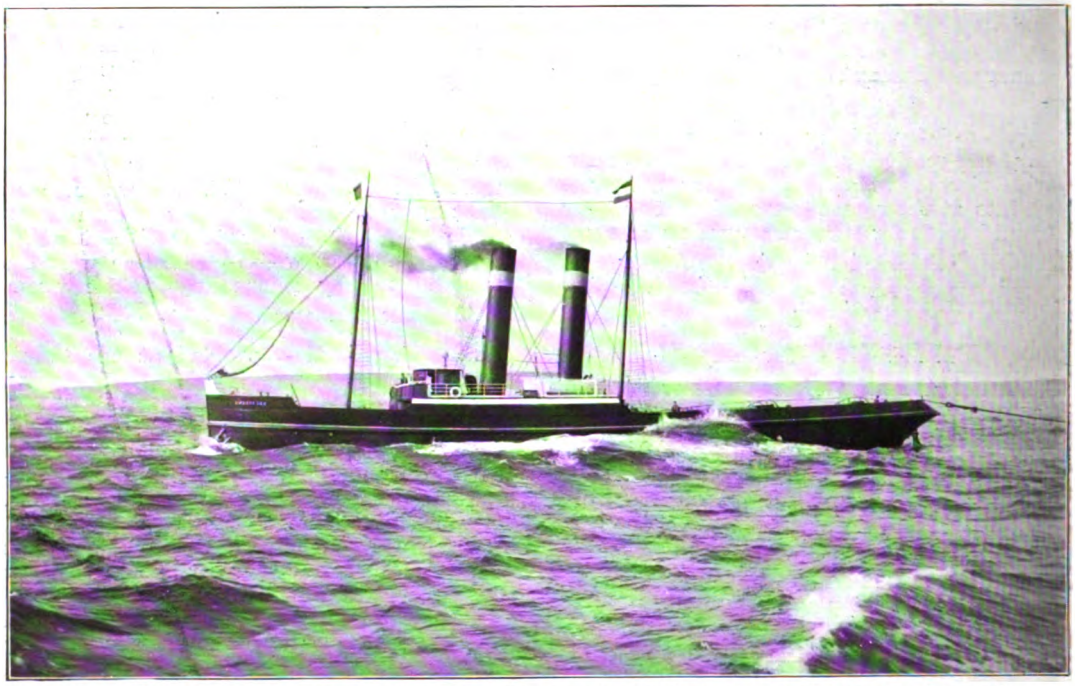
Maritime Wireless Telegraphy

An Echo of the "Delhi" Wreck

THE official inquiry ordered by the Board of Trade into the circumstances connected with the stranding of the steamship "Delhi" on the coast of Morocco on December 13th, whereby loss of life ensued, recalls a sad episode during the holiday season, brightened only by the gallant aid brought through the timely intervention of wireless telegraphy. It will be remembered that this was the vessel in which the late Duke of Fife with the Princess Royal and their daughters was proceeding to Egypt, and the disaster was the cause of the drowning of three French seamen.

It is common knowledge that fortunately all the passengers and crew of the "Delhi" herself were saved. A picture of the tempestuous scene is obtained from the evidence of the captain of the ill-fated vessel. "The weather," he said, "was overcast and it was raining but not foggy, and he thought the reason he did not see Spartel light was that it was shut out by the mist which comes down from the land in the Straits of Gibraltar; it comes down from the mountains like a blanket. Then breakers were seen ahead. At first he thought they were not breakers, but that it was 'tide rip.' The engines were at once reversed, but the vessel struck almost at once. The weather must have been thick, although it did not appear to be thick at the time in the vicinity of the ship, but he heard no sound signals."



S.S. "Zwarte Zee" equipped with wireless apparatus by the Compagnie de Télégraphie Sans Fil.

The remainder of the story is now too well known to need recapitulation here. Wireless messages were sent *via* the newly-opened Marconi Station at Cadiz to Gibraltar, which in turn communicated with other vessels, and thus brought help to the ship in distress. It was impossible to save the ship, but the human freight, numbering 86 passengers and 235 crew, were brought safely ashore and 3,500 tons of general cargo saved. It is too horrible to contemplate what might have happened had there been no wireless on board. The "Delhi"

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experience is a lesson the moral of which should never be lost upon shipowners and the travelling public.

Wireless and Insurance

THE increased security afforded to ships equipped with wireless is bound, sooner or later, to have some effect upon marine insurance rates. The life-saving effect (if we may so term it) of wireless telegraphy has been so convincingly demonstrated that one has scarcely had time to realise the vast saving effected in general cargo and ships themselves, for in many cases the aid summoned from the small wireless cabin of a disabled vessel left to the mercy of a remorseless sea has been the means of bringing the ship safely into port. Doubtless the comparative newness of wireless has retarded recognition of this important fact. In the course of his annual report the United States Commissioner of Navigation points out that besides the vessels equipped under the Wireless Ship Act of 1910 there are already in the United States 142 vessels, including fifteen yachts, voluntarily equipped with wireless. Mr. Chamberlain explains that economies in despatch, in securing pilots and loading berths, as well as the demands of the public travelling by sea on small steamers, have impelled owners to incur the expense involved in equipment. Thus far the marine insurance companies have not made a distinct difference in marine rates on hulls and cargoes on account of wireless, but the subject has been under consideration by insurance companies and underwriters, and the time doubtless is not remote when part at least of the expense of equipment will be offset by recognition in insurance rates. The fact that a vessel at sea which can communicate at will with other vessels or shore stations hundreds of miles distant is in less risk of heavy or total loss than one out of touch with the rest of the world is not now entirely ignored in insurance.

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Mr. William J. Bryan, the famous American publicist, suggests legislation requiring the assignment of two wireless operators to each steamer at sea. Mr. Bryan was a passenger on the steamer "Prinz Joachim" which went ashore recently in the West Indies.

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How wireless telegraphy may materially assist a great commercial community like Manchester was pointed out by an expert to a *Sunday Chronicle* representative. "I have no doubt in my mind," he said, "that during the next few years all the steamers coming into Manchester will be fitted up with the apparatus. I have been told that on several of the boats belonging to the Manchester Liners, Ltd., the apparatus is being installed. Such an introduction on the Manchester steamers would assuredly prove of great service to the merchants, since it would enable them to get earlier information as to when they might expect their goods. Travellers overseas," he stated, "were more and more inquiring, in booking their passages, whether a steamer was equipped with wireless apparatus. If it is, they seem to feel a greater sense of security."

The successful adoption of wireless telegraphy for submarines has resulted in a considerable extension of this practice. The builders of a submarine for the Portuguese Government have instructed the Marconi Company to fit a 1-kw. set to this vessel.

The s.s. "Nonsuch" before calling at Rotterdam recently met with very bad weather, in the course of which she had a mast broken and suffered other damage which interfered with her proper navigation. The captain had, therefore, to send a wireless message to Rotterdam for a tug-boat. As this message contained certain information as to the whereabouts of the "Nonsuch," the bill for services rendered was only about one-third of what it would otherwise have been, thus saving a considerable sum of money to the owners of the "Nonsuch." This is another instance of the great economies that it is possible to effect by the equipment of vessels of all descriptions with apparatus for wireless telegraphy.

The Compagnie Générale Transatlantique have decided to establish a direct shipping line between France and Canada, and from April 27th two ships with wireless telegraph installations will be ready for this service. The sailings will take place every four weeks.

A contract has recently been signed by the Belgian Government for the delivery of two new turbine steamers for the Dover and Ostend Mail Service. As in the case of all the steamers belonging to this line, these new boats will be fitted with the Marconi system of wireless telegraphy. The internal fittings and decorations will be identical with those of the "Jan Breydel" and the "Pieter de Coninck," but their length—viz., 330 ft.—will be slightly less. The "Frahn" Anti-rolling System will be installed, which will reduce, if not quite abolish, the terrors of sea-sickness. As the Belgian Administration was the first to inaugurate the wireless telegraph system in the cross-Channel service, so it will be the first to provide this anti-rolling system. The boilers will be of the "Babcock & Wilcox" type, and according to the contract the speed must be 24 knots per hour.

Some interesting orders for standard Marconi 1½ kw. and emergency plant were placed during the past month. The cable ship "Ramos" is amongst the boats now being equipped. The "Berwindvale," orders for the equipment of which have just been received from the owners, the Havana Coal Company, will be engaged in carrying coals like its sister ship the "Berwindmoor." The "Irishman," which is being equipped for the White Star line, will be engaged in carrying passengers and cargo in the Australian trade. Equipments have been ordered for three vessels for the Royal Mail Steam Packet Company—namely, "Pardo," "Pataro," and "Parana." The P. & O. vessel, the "Narrung," is intended for the company's new branch line to West Australia. The popularity of wireless telegraphy on the cross-Channel services is further evidenced by the instructions to equip two vessels—the "Normannia" and "Hantonia"—for the London & South Western Railway. These boats will ply between Southampton and Havre. Amongst other orders received is one from the Anglo-American Oil Company for the equipment of seven of their vessels.

Some good instances of the services of Marconi wireless were disclosed on the arrival of the Pacific liner "Oropesa" at Liverpool. On the way the vessel picked up the station at Cadiz from 1,600 miles distant, and from the Bay of Biscay got in touch with Algiers; in this case the sound waves travelled right across Spain, thus overcoming every land obstruction. A message sent from a thousand miles south of Fernando Noronha (in a couple of seconds) took four days to travel over sixty miles by ordinary land transport, and was delivered to the sender after he had reached his distant friend with whom he thought he had communicated.

La Cie Française Maritime et Coloniale de Telegraphie Sans Fil have received instructions to equip the s.s. "Manouba" of the Compagnie de Navigation Mexit, and the s.s. "France," owned by the Compagnie Generale, with Marconi sets.

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Athletics

Though little prominence has been given to the doings of the Marconi Athletic Clubs both at the head offices in London and at the offices and works at Chelmsford, the clubs have been progressing steadily, and have worthily maintained their reputation. Twice in the course of the season the football clubs representing the Chelmsford and London office staffs engage each other in a battle royal. The second of these matches this season took place on Saturday, January 27th, too late, unfortunately, to be referred to in the February issue of THE MARCONIGRAPH. The match took place on the ground of the London club at Sydenham, and the Chelmsford team and their supporters, numbering seventy, received a cordial welcome from the supporters of the home club. The match was very interesting, and although the home club played a good game, they were unable to overcome their visitors, who carried off the honours of the day by 3 goals to 1. Victors and vanquished assembled in great spirits after the match to partake of tea at Lipton's Tea Rooms in Kingsway, when over 100 sat down to enjoy an excellent refresher. The day was wound up with a visit to the Coliseum.

Personal

Mr. C. E. Spagnoletti has been elected an Honorary Member of the Institution of Electrical Engineers. Many years ago Mr. Spagnoletti did great and useful work in the development of telegraphy. Nowadays people are apt to think, perhaps, lightly of electrical work which has not a big electrical power at the back of it, but they must remember that work of the very greatest importance was done many years ago in the first commercial application of electricity, *viz.*, the telegraph. Mr. Spagnoletti was a distinguished inventor and worker in the development of the telegraph system.

Movements of Engineers

H. J. Round sailed for Brazil on February 16th to carry out special tests at the wireless stations of the Madeira Mamore Rly. Co.

C. C. Chapman and H. E. Watterson also sailed for Brazil, and on arrival will take charge of the stations at Manaos and Porto Velho.

A. B. Blinkhorn, having satisfactorily completed the tests on the Greek battleship "Averof," left Athens on February 20th for England.

G. H. Magnee arrived back from Borneo on February 2nd.

E. Richards has gone to Poldhu for a course of instruction in High-Power Station Work.

R. H. Strickland is going through the Instructional Course at Broomfield Station.

Movements of Operators

E. G. Hutton, from the "Montezuma" to the "Vectis."

K. W. Page, from the "Mongolia" to the "Danube."

W. H. Knapman, from the "Merion" to the "Montreal."

A. G. Powell, from the "Montreal" to the "Ascania."

C. B. Webb, from the "Ascania" to the "Berwindmoor."

W. H. Monger, from the "Mooltan" to the "Mongolia."

C. E. Masters, from the "Corinthic" to the "Carisbrook Castle."

E. W. Dexter, from the "Columbia" to the "Mongolian."

S. V. Branton, from the "Oceanic" to the "Montfort."

A. C. Arnold, from the Marconi School to the "Baltic."

J. D. Cannon, from the "Carmania" to the "Christopher."

J. B. Stone, from the "Christopher" to the "Carmania."

F. M. Bailey, from the "Empress of Ireland" to the "Corsican."

J. Connell, from the "Empress of Ireland" to the "Empress of Britain."

G. E. Hake, from the Marconi School to the "Empress of Britain."

H. J. Belcher, from the Marconi School to the "Campania."

G. McCormack, from the "Leinster" to the "Munster."

J. McLeod, from the Marconi School to the "Ortega."

C. W. Perkins, from the "Stephen" to the "Campania."

J. R. Thomson, from the "Lanfranc" to the "Cymric."

A. Crofts, from the Marconi School to the "Empress of Ireland."

A. H. Jefferies, from the "Ulster" to the "Leinster."

C. V. Mathieu, from the "Oropesa" to the "Mount Temple."

D. Robertson, from the "Mount Temple" to the "Campanello."

R. Ferguson, from the "Campanello" to the "Tarquah."

C. Peters, from the "Ivernia" to the "Stephen."

J. M. Martin, from the Marconi School to the "Carmania."

H. Cottam, from the "Medic" to the "Carpathia."

C. Searl, from the "Atahualpa" to the "Medic."

J. B. Stone, from the "Carmania" to the "Oropesa."

S. Lemon, from the "Tarquah" to the "Teutonic."

H. E. Solway, from the Marconi School to the "Teutonic."

A. Bayliss, from the Marconi School to the "Celtic."

L. B. Cleary, from the "Bohemian" to the "Ivernia."

S. W. Lewis, from the "Celtic" to the "Lanfranc."

Australasian Branch

W. H. Payne, late officer-in-charge "Karoola," assisting with ship installation work.

J. L. Mulholland, appointed officer-in-charge to the "Koombana."

H. E. Buik, appointed to the "Grantala."

A. O'Kelly, appointed to the "Tofua."

G. F. Chilton, appointed officer-in-charge to the "Karoola."

W. H. C. Phillips, appointed to the "Maitai."

J. F. Wilson (from London), took charge of the "Marama" at Vancouver.

R. Hearle (from London), took charge of the "Zealandia" at Sydney.

E. N. Barnwell arrived from London as officer-in-charge of the "Tahiti."

Messrs. G. Haysom, Ltd., of 110, Fenchurch Street, London, the well known firm of naval tailors and outfitters, have now opened a branch at 38a, Westerstraat, Rotterdam, in order to cope with their increasing Continental business. Operators requiring regulation uniforms can obtain same at any of Messrs. Haysom's establishments at special rates.

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